

INTRODUCTION

HEALTH

Health is that complete fitness of body, soundness of mind, and wholesome of emotions, which make possible the highest quality of effective living and of service.

The World Health Organization has defined health as: *“A state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity.”*

Health is greatly influenced by the Environment that we live in. Environmental health is a two-way street. Our environment, in the largest sense, is the complex network of physical, chemical, biological, and ecological components that make up the natural world. How clean and unpolluted the air, water, and soil of this environment are can affect the health of human beings. On the other hand, the way people treat the environment in their professional, industrial, and recreational activities helps determine how clean and safe it will be. In short, the environment affects the health of human beings, and human beings affect the health of the environment. All of the issues that evolve out of the interaction between people and the environment fall under the umbrella of environmental health.

The word ‘**Environment**’ means what surrounds. Humans experience the environment in which they live as an assemblage of physical, chemical, biological, social, cultural, and economic conditions which differ according to local geography, infrastructure, season, time of day, and activity undertaken.

Environment is defined as “the sum total of all conditions and influences that affected the development and life of organisms.” (Environment Protection Act, 1986)

The environment in which we live can be considered as having three fundamental sets of components:

- Physical [energy of one form or another]

- Chemical [matter i.e. substances whether natural or man-made]
- Biological [living things].

Environment is auto regulated entity. However, equilibrium is very sensitive to external stimuli, such as human activities promoted by socio-economic goals. In recent years, with industrialization, increasing urbanization consumerism and lopsided development pattern, environmental degradation has increased manifold, beyond natural capacity of Environment to balance itself. More than just fast depleting natural resources, it has given rise to a variety of new diseases and has taken a toll over human health.

ENVIRONMENTAL POLLUTION

Environmental pollution is the unfavorable alteration of surroundings, wholly or largely as a by-product of man's actions, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution and abundances of organisms. These changes may affect man directly, or indirectly, or through his supplies of water and of agricultural and other biological products, his physical objects or possessions, or his opportunities for recreation and appreciation of nature.

A *pollutant* can be defined as “*any solid, liquid, or gaseous substances present in such concentration as may be or tend to be injurious to environment*”. It can also be defined as “*resources out of place,*” the byproducts of human behavior and metabolism.

The risk transition

Environmental threats can be classified into ‘traditional hazards’ associated with lack of development and ‘modern hazards’ associated with unsustainable development. *The changing pattern of environmental health hazards and associated health risk- moving from ‘traditional’ to ‘modern’ with time and economic development has been called ‘ risk transition’.*

Traditional environmental health hazards related to poverty and ‘insufficient’ development include

- 1 Lack of access to safe drinking water;
- 2 Inadequate basic sanitation in the household and the community;
- 3 Food contamination with pathogens;
- 4 Indoor air pollution from cooking and heating using coal or biomass fuel;
- 5 Inadequate solid waste disposal;
- 6 Occupational injury hazards in agriculture and cottage industries;
- 7 Natural disasters including floods, droughts, and earthquakes; and
- 8 Disease vectors, mainly insects and rodents.

Modern environmental health hazards are related to rapid development that lacks adequate health-environment safeguards along with unsustainable consumption of natural resources. These hazards include

- 1 Water pollution from populated areas, industry, and intensive agriculture;
- 2 Urban air pollution from motor cars, coal power stations, and industry;
- 3 Solid and hazardous waste accumulation;
- 4 Chemical and radiation hazards due to introduction of industrial and agricultural technologies;
- 5 Emerging and re-emerging infectious disease hazards;
- 6 Deforestation, land degradation, and other major ecological changes at local and regional levels; and
- 7 Climate change, stratospheric ozone depletion, and trans boundary pollution.

Types of pollution

Various types of pollution are classified in different ways. On the basis of the type of environment being polluted, we may recognize four basic pollutions including others.

- 1). Air pollution (Indoor and out door pollution)
- 2) Water pollution
- 3) Land (soil) pollution (including Solid waste)
- 4) Noise pollution

Along with this, there are some newer kinds and causes of pollution which are looming larger day by day. They are vital and need to be handled with additional care.

1) Solid Waste Management

2) Food Adulteration

3) Radiation Pollution

Thus, it is imperative for us to conserve environment to promote health. It is only through awareness and everyday efforts that we can save environment and save ourselves from ill effects of polluted environment. Further chapters will deal with various kinds of environmental pollution and their health hazards.

AIR POLLUTION AND HEALTH PROBLEMS

Air is the mixture of gases that surround earth due to its gravitational pull. It is colourless, odourless and tasteless mixture that forms earth's atmosphere. It contains Nitrogen (79.1%), Oxygen (20.0%), Carbon dioxide (0.03%) and traces of inert gases like argon, krypton, xenon, neon, helium, ammonia, ozone, water vapour and suspended particles (0.07%).

We need air to perform certain vital life functions. All human beings and animals breathe in Oxygen and breathe out Carbon dioxide. Plants breathe in Carbon dioxide and breathe out oxygen in the day time to manufacture their own food through Photosynthesis. But they follow the pattern of animals at the night. Without Air there would be no transmission of sound and radiation waves, no burning of fire and cycle of seasons.

AIR POLLUTION

When the natural composition of air is altered to such an extent, so as to make it harmful for living creatures primarily due to human activities, air is said to be 'polluted'. Any substance that causes pollution is called pollutant. Pollutants can be solid, liquid or gaseous substance.

Air is polluted by natural ways of volcanic eruptions, forest fires, pollen from plants etc. However, nature has a way of balancing itself. Our concern here is man caused pollution which is looming largely as a threat to modern civilization.

Pollution can be INDOOR as well as OUTDOOR:

INDOOR AIR POLLUTION refers to the physical, chemical, and biological characteristics of air in the indoor environment within a home, building, or an institution or commercial facility. Indoor air pollution is a concern in the developed countries, where energy efficiency improvements sometimes make houses relatively airtight, reducing ventilation and raising pollutant levels. Indoor air problems can be subtle and do not always produce easily recognized impacts on health. *Tobacco smoke, cooking and heating appliances, and vapors from building materials, paints, furniture, etc. cause pollution inside buildings.*

Volatile organic compounds originate mainly from solvents and the main indoor sources are perfumes, hair sprays, furniture polish, glues, air fresheners, moth repellents, wood preservatives, and many other products used in the house. Their main health effect is the irritation of the eye, nose and throat. In more severe cases there may be headaches, nausea and loss of coordination. In the long term, some of the pollutants are suspected to damage to the liver and other parts of the body.

Tobacco smoke generates a wide range of harmful chemicals and is known to cause cancer. It is well known that passive smoking causes a wide range of problems to the passive smoker (the person who is in the same room with a smoker and is not himself/herself a smoker) ranging from burning eyes, nose, and throat irritation to cancer, bronchitis, severe asthma, and a decrease in lung function.

Biological pollutants include pollen from plants, mite, hair from pets, fungi, parasites, and some bacteria. Most of them are allergens and can cause asthma, hay fever, and other allergic diseases.

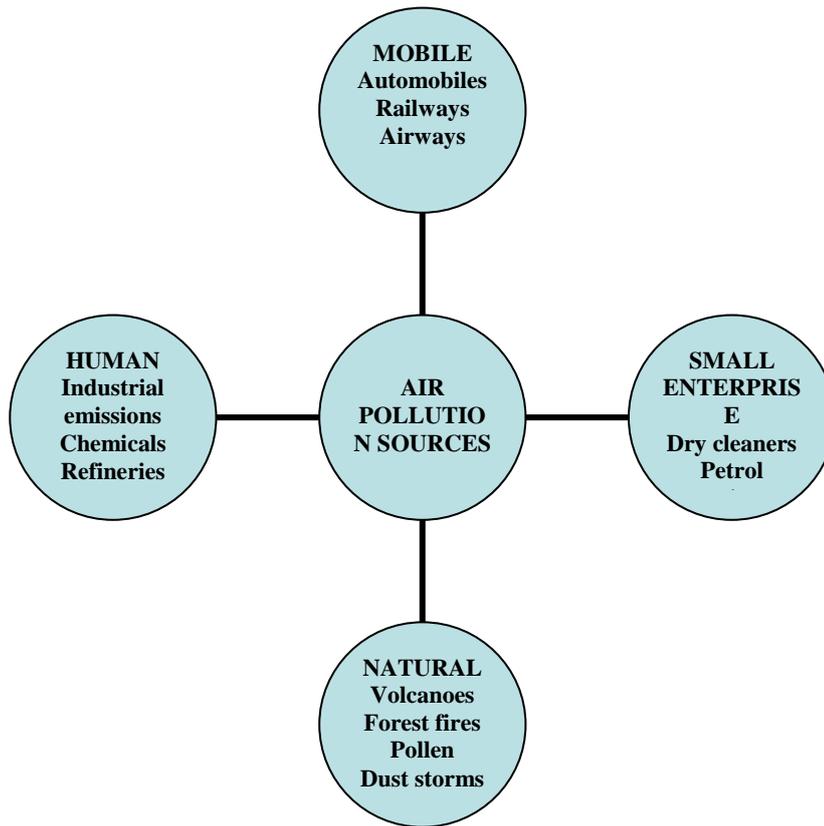
Formaldehyde is a gas that comes mainly from carpets, particle boards, and insulation foam. It causes irritation to the eyes and nose and may cause allergies in some people.

Asbestos is mainly a concern because it is suspected to cause cancer.

Radon is a gas that is emitted naturally by the soil. Due to modern houses having poor ventilation, it is confined inside the house causing harm to the dwellers.

OUTDOOR AIR POLLUTION is the pollution that occurs outside homes through automobiles, industrial emissions etc.

SOURCES OF AIR POLLUTION:



MAIN AIR POLLUTENTS AND THEIR IMPACT ON HEALTH

- 1) Oxides of sulphur 2) Oxides of Nitrogen 3) Suspended Particulate Matter 4) Suspended Particulate Matter 5) Carbon Monoxide 6) Lead 8) Benzene 9) Hydrocarbons

Noxious gases and their effects on health

AIR POLLUTANT	MAJOR SOURCES	HARMFUL EFFECTS & DISEASES CAUSED
<i>Gaseous Pollutants</i>		
Oxides of nitrogen (NO _x)	It originates from combustion (N ₂ in air is oxidized); the transport and	A brownish gas that irritates the respiratory system mainly to

Nitrogen Dioxide: NO ₂	industrial sectors are the major sources of NO _x . NO _x is the sum of NO, NO ₂ , other oxides of Nitrogen.	pulmonary tract, affect the functioning of lungs, highest concentration can result in the narrowing of the air passage.
Ozone: ground level O ₃	A primary constituent of urban smog, formed with reaction of VOC + NO _x in presence of heat +sun light. Found in Silent electrical discharge, Arc welding	Major harmful effects on human health include eye, nose & throat irritation and reduced resistance to colds. It can also aggravate asthma and bronchitis.
Carbon monoxide: (CO)	It is a product of incomplete combustion of fossil fuels, such as petrol, diesel, coal.	It reduces bloods ability to carry O ₂ , can lead to progressive Oxygen starvation and severe health effects, and could sometimes even fatal.
Sulfur Dioxide: SO ₂	It is formed when fuel (coal, oil) containing Sulphur is burned and metal smelting, burning of fossil fuels.	It is precursor to acid rain along with NO _x , causes irritation of eyes and the respiratory system, increased mucous production, cough and shortness of breath.
Hydrogen sulphide	City sewage, Decay of organic waste	Affects cattle, dogs, pigs and chicken. Also, cause headache and further damage in human if inhaled in large quantities
Acid fumes	Fertilizers and chemical industry, metal finishing	Cause acid rain that harms crops and marine life, enter human body through food chain and cause health hazard
Vapour of organic solvent	Paints and varnish industry, Dry-cleaning	Irritation in eyes, nose and throat

<i>Solid Pollutants</i>		
Suspended particulate matter (SPM)	Smoke, Dust, Aerosols, Flyash from coal- based thermal power stations	Causes poor visibility especially during winter, leads to difficulty in breathing, may cause respiratory and lung diseases
(a)Lead oxide:	Leaded petrol, Lead-acid batteries, Paints Found in tetraethyl lead, anti knock agent in gasoline and Vehicular exhaust.	Damage the nervous system, may also cause cancer MINAMATA It can cause learning disabilities in children, toxic to liver kidney, blood forming organs.
(b) Silica / Coal dust	Mining, Stone-crushing, construction industry	Causes SILICOSIS
(c) Asbestos fiber	Asbestos mining, Manufacturing of asbestos sheets, Fire proof fabric etc	Causes a disease called ASBESTOSIS and lung cancer
Cement	Cement industry, construction of buildings	
Unburnt Hydrocarbon	It is found in particles of unburnt liquid fuel.	Some of the compounds are strong irritants of the eye, nose and throat.
Chlorofluoro carbons (CFC's)	Air conditioners, Refrigerators, Aerosols	Depletion of ozone layer

Health impacts of air pollution depend on pollutant type, its concentration in air, interaction with other pollutants, and length of exposure and individual vulnerability.

Air Pollution has both acute and chronic effects on Human health. It has both long term and short term effects. It may range from minor irritation to most chronic respiratory problems.

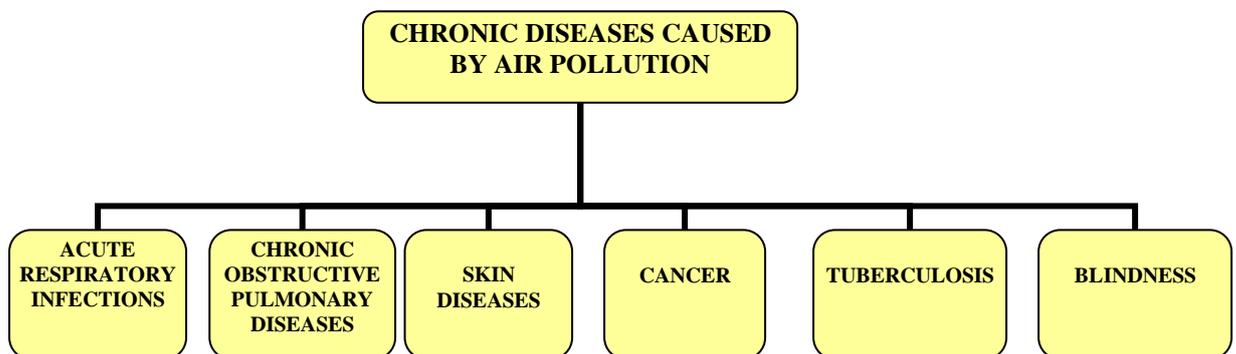
IMMEDIATE HEALTH PROBLEMS FROM AIR POLLUTION

- Aggravated cardiovascular and respiratory problems

- Burden on heart and lungs, causing them to work harder to supply the body with oxygen
- Damage the cells in respiratory organs
- Damage to deeper portions of lungs, even after symptoms of coughing or sore throat disappear
- Wheezing, chest pain, dry throat, headache or nausea
- Increased reactivity to allergens and particles
- Eye irritation
- Reduced body immunity to infection and increased fatigue
-

LONG TERM EFFECTS OF AIR POLLUTION AS PERMANENT HEALTH PROBLEMS:

- Accelerated ageing of lungs and loss of lung capacity
- Decreased lung function
- Diseases like, asthma, bronchitis, emphysema and cancer
- Is a potential cause of human mortality



1. Acute respiratory infections (ARI) in children: *ARI in children under 5 years in India cause: 13% of deaths; 11% of NBD; 24% of NBD for children under 5 years (NBD- National Burden of Disease)*

ARI is the largest single disease category for India, accounting for about one-ninth of the national burden. For the world as a whole, ARI is also the largest category, accounting for about 8.5% of the global burden.

Acute respiratory infections as pneumonia, is one of the chief killers of children in Developed Countries. It is well known to be enhanced by exposure to urban air pollutants and indoor environmental tobacco smoke at levels of pollution that are some 10-30 times less than that typically found in villages.

A recent study of 642 infants conducted in urban slums of New Delhi. The incidence of acute respiratory infection was more in highly polluted areas than less polluted areas. In India, children have to bear the double the burden of diseases that have persisted for generations as well as of new diseases caused by various environmental factors.

Asthma: *Asthma causes: 0.2% of deaths; 0.5% of NBD in India.* Although Asthma rates are officially low in India, there is some recent evidence that the true prevalence is higher than previously thought. Associated with urban outdoor pollution and ETS (Environmental Tobacco smoke), typical solid-fuel indoor smoke exposures are much higher. Undoubtedly, the rates of Asthmatic patients have been increasing; it might be due to increase in the environmental pollution.

2. Chronic obstructive pulmonary disease: Today in developed countries, nearly all cases of COPD are attributable to tobacco smoking. Undoubtedly, smoking is also a significant factor in COPD incidence among LDC (Less Developed Countries) men. In India, even though relatively few rural women smoked during the past decades, COPD in rural women today is not uncommon. Chronic obstructive lung disease, for which tobacco smoking is the major risk factor remaining in the developing countries is known to be an outcome of excessive exposure to air pollution.

3. Cancer: There are many chemicals in biomass smoke, which are carcinogenic in nature. In recent study in Japan on the other hand, found that women aged 30 years old cooking with wood fuel have an 80% increased chance of having lung cancer in later life.

4. Tuberculosis: India has a larger fraction of its national burden of disease attributable to TB than any other region, although the actual risk per person is less than that in Sub-Saharan Africa. A large scale survey in India reported that women using bio fuels were three times more likely to have tuberculosis than women using cleaner fuels.

5. Blindness: India has a larger burden of blindness than any other major region of the world. Indeed, globally, one out of three cataracts occurs in India where they are responsible for 80% of blindness in the country. One case-control study in Delhi found an excess cataract risk of about 80% among people using biomass fuel.

The Health Information of India reports show that environmental reasons are increasingly responsible for increased mortality in women and children (see graphs: What kills India's children). According to the report, 55 percent of child mortality in India is due to conditions originating in the peri natal period. A significant proportion of the tables are strongly related to environmental causes.

ENVIRONMENTAL EFFECTS OF AIR POLLUTION

1) ACID RAIN:

When the strength of the hydrogen ion concentration is below 5 in the rain, it is acid rain. When the oxides of sulphur and nitrogen come emitted by industries or combustion of fuels; in air, come in contact with water vapour and fall on earth with rains, it is called acid rain. This increases the acidity of soil, damages crops and aquatic and marine life, enters food chain and harm human health. It also corrodes heavy metal. It damages the structures made of marble, cement or lime. It promotes the corrosion of metallic structures as bridges and towers.

2) GREEN HOUSE EFFECT:

Carbon di oxide absorbs and distributes heat on earth. When carbon di oxide content of the air increases drastically, there is subsequent increase in earth's temperature due to trapping of heat reflected by earth. This is known as 'green house effect', co₂ acting as glass panel of greenhouse which allows heat to enter the earths atmosphere but does not allow it to be radiated back to space. Carbon di oxide, methane, nitrous oxide, chlorofluorocarbons, and ozone are main green house gases. This global warming on account of green house effect has lead to melting of polar ice caps, thereby increasing sea level and submerging of coastal land. This will impact populations living in coastal areas and with depleting underground water and erosion, cause sufficient economic impact. With global warming, growth of plants and regularity of climate are effected greatly.

3) GROUND LEVEL OZONE:

Ozone is a highly reactive gas that forms in the atmosphere when three atoms of oxygen (O₃) are combined in a chemical reaction. At ground level, it is created by a chemical reaction between oxides of Nitrogen and volatile organic compounds in the presence of sunlight. Ground level ozone is mainly formed due to human activities and is the main component of Petrochemical smog. It is produced in urban areas where there are a lot of cars, industry, and other sources of combustion. Ground level ozone can cause acute respiratory problems, aggravate asthma, temporarily decrease lung capacity, cause inflammation of lung tissue, impair the immune system and make person more susceptible to bronchitis and pneumonia. Even low levels of ground ozone can trigger a variety of health problems like, chest pain, congestion, throat irritation, coughing and nausea. Asthmatic and children are at greatest risks. The chance of experiencing adverse health effects from elevated ozone levels increases during heavy exercise and outdoor activity.

4) OZONE DEPLETION:

Ozone in stratosphere prevents sun's harmful UV and infrared rays from entering earth's surface. Man made emissions of CFC'S and other chemicals used in refrigeration,

deodorants, perfumes, fire extinguisher and cleansing agents interferes with the process of ozone formation in stratosphere and has caused large holes in ozone layer, leading to greater entry of harmful UV and infrared rays of sun. Jet engines, motor vehicles, nitrogen fertilizers and other industrial activities are also responsible for emission of CFCs and NO_x. Ultraviolet radiation causes skin cancer, cataract and causes reduction of body immunity. It affects marine food and certain varieties of crops like rice and soya.

WHAT WE CAN DO TO REDUCE AIR POLLUTION

- ✓ Share vehicles, use CNG public transport, and use your bicycle for short distances. This will reduce traffic on roads causing lesser pollution.
- ✓ Motivate your parents to take vehicles for regular emission tests, fit them with catalytic converters and use only unleaded petrol.
- ✓ Plant trees and tender saplings at home and in school. They will act as carbon absorbing sinks.
- ✓ Reduce electricity consumption by switching off television, fans, lights etc. This reduces emissions of SO₂, NO_x, VOCs and particulate matter.
- ✓ Do not burn dry leaves and stop others from doing it. It is banned by Delhi government. Put leaves in compost pit.
- ✓ Postpone lawn and gardening activities that will require gasoline- powered equipment.
- ✓ Do not smoke and allow no smoking in your house.
- ✓ Keep doors and windows of your house open for ventilation and put exhaust fans in places like kitchen and bathroom.
- ✓ Do not burst crackers on Deepawali. It creates both air and noise pollution.

Healthy man breaths 22000 times a day and takes in about 16 kg of air

Carbon monoxide is the most dangerous pollutant. Carbon monoxide if inhaled combines with hemoglobin of our blood to form carboxyhaemoglobin. Carboxyhaemoglobin is not able to carry the oxygen. This causes deficiency of oxygen in the tissues leading to suffocation and even death. It is due to this reason that sleeping in a room heated by coal fire and with all windows, doors closed, is not advised.

WATER POLLUTION AND HEALTH HAZARDS

Water is a clear, transparent, odourless and tasteless liquid. Chemically, it is formed when an atom of oxygen (O) combines with two atoms of hydrogen (H) to form one molecule of water (H₂O).

Water covers more than two-thirds of the Earth's surface. But fresh water represents less than 0.5% of the total water on Earth. The rest is either in the form of seawater or locked up in icecaps or the soil, which is why one often hears of water scarcity in many areas.

Water is the basic necessity of life, not only for human beings but also for plants and animals. **Water accounts for 65% of our body weight, 70% of brain, 83% of blood and nearly 90% of lungs comprise of water.** We need water for almost all purposes like drinking, cooking, bathing, agriculture, hydropower, transportation etc.

WATER POLLUTION

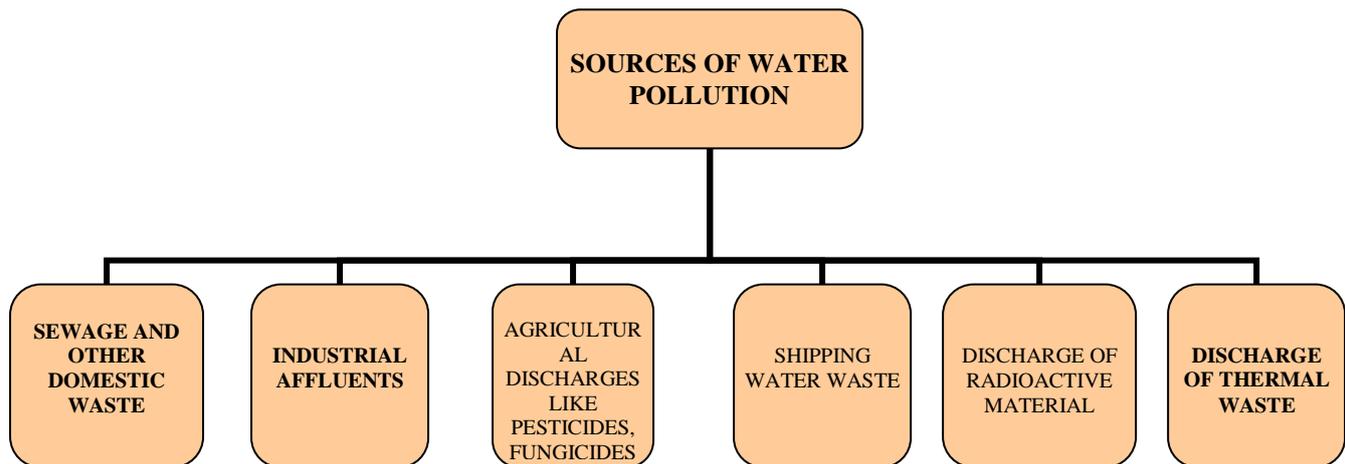
Normally water is never pure in a chemical sense. It contains impurities of various kinds-dissolved as well as suspended. These include dissolved gases (H₂S), CO₂, NH₃, N₂), dissolved minerals (Ca, Mg, Na salts), suspended matter (Clay, silt, sand) and even microbes.

Water pollution is defined as *“the addition of any substance to water or changing of water’s physical and chemical characteristics in any way which interferes with its use for legitimate purposes”*.

Polluted waters are turbid, unpleasant, bad smelling, unfit for drinking, bath, and washing or other purposes. They are harmful and are vehicles of many diseases as cholera, dysentery, typhoid etc.

Natural water pollution may happen through decomposed vegetables and animals that are brought into water resources.

Man made process of water pollution is our chief concern here.



DIRECT CAUSES OF WATER POLLUTION

- Discharge of untreated domestic sewage into waterways

It includes large quantities of human excreta, food wastes, modern synthetic detergents, water based paints and domestic wastes. When man consumes such water, it causes diseases like cholera, typhoid, dysentery etc.

- Discharge of industrial effluents

The textile, sugar, fertilizer, rubber, plastic, rayon fibers and paper factories and oil refineries all produce chemical pollution. It is discharged into rivers, lakes and other water bodies and cause chemical contamination.

- Use of pesticides, herbicides, fungicides and weedicides that seep into ground water

Various pesticides that are widely used in houses and in fields to eradicate pests and insects to protect crops cause water pollution when they are carried by wind or percolate through water and finally enter large water bodies. Most common of these kinds are, DDT, BHS, elderin, toxaphene and heptachlor etc.

- Discharge of plant nutrients and fertilizer residues as runoff from farms to water bodies

Modern agricultural practices require use of artificial fertilizers in great quantities. Although it ensures better yield of crop, yet, fertilizers seep into ground water or are carried to lakes and ponds and contaminate water.

- Discharge of thermal waste into water body

Oils form a thick layer on water surface, cutting it from outside environment and making aquatic plants and animals face oxygen deficiency. Thus they pollute water and cause immediate harm to aquatic life.

- Discharge of radioactive materials

Wastes of Uranium and Thorium mining and refining from nuclear power plants and from medical, industrial and scientific utilization of radioactive materials result in water pollution due to harmful; radiation.

- Discharge of thermal waste

Various industrial processes may utilize water for cooling and resultant warm water is often discharged into streams or lakes. Coal-oil-fired generators and atomic energy plants produce large amount of waste heat, which is carried away as hot water and cause thermal pollution.

INDIRECT CAUSES OF WATER POLLUTION

Acidification-Acidification of surface water, mainly lakes and reservoirs, is one of the major environmental impacts of transport over long distance of air pollutants such as sulphur dioxide from power plants, other heavy industry such as steel plants, and motor vehicles.

One of the major sources of water pollution is **Acid Rain**. This is a term used to describe rain or snow that has been polluted by Nitric and Sulphuric acid. Acid rain is formed when there is a combination or a reaction of the water vapour in the air with the gas emitted by vehicles,

factories and other sources. These acidic gases and particles can even reach the Earth when there is no rain. Scientists use the term Acid Deposition to refer to wet and dry Acid Pollution that reaches the Earth.

Marine pollution occurs as sewage, garbage, pesticides, and discharge of oil and petroleum products. A solid waste like mercury, which may be dumped into the rivers, ultimately goes into the sea. The large amount of plastic bags dumped into the oceans has threatened marine life. Ingested by sea birds, it causes gastro-intestinal diseases and ulcers since plastic contains PCB, a chemical known to cause eggshell thinning and tissue damage. Recent Mumbai floods were a result of use of plastics.

DISEASES CAUSED BY WATER POLLUTION

Category	Examples
Water-borne infections microbial chemical	Diarrhoea, typhoid, cholera Fluorosis
Water-washed infections skin and eyes diarrhoeal diseases	Scabies, trachoma Dysentery
Water-based infections penetrating skin ingested	schistosomiasis worm
Insect vectors related diseases vector bite breeding in water	Sleeping sickness, Yellow fever

KINDS OF POLLUTENTS AND DISEASES THEY CAUSE

Pesticides. The organophosphates and the carbonates present in pesticides affect and damage the nervous system and can cause cancer. Some of the pesticides contain carcinogens that exceed recommended levels. They contain chlorides that cause reproductive and endocrinal damage.

Lead. Lead is hazardous to health as it accumulates in the body and affects the central nervous system. Children and pregnant women are most at risk.

Fluoride. Excess fluorides can cause yellowing of the teeth and damage to the spinal cord and other crippling diseases.

Nitrates. Drinking water that gets contaminated with nitrates can prove fatal especially to infants that drink formula milk as it restricts the amount of oxygen that reaches the brain causing the 'blue baby' syndrome. It is also linked to digestive tract cancers.

Petrochemicals. Benzene and other petrochemicals can cause cancer even at low exposure levels.

Chlorinated solvents. These are linked to reproduction disorders and to some cancers.

Arsenic. Arsenic poisoning through water can cause liver and nervous system damage, vascular diseases and also skin cancer.

Other heavy metals. -Heavy metals cause damage to the nervous system and the kidney, and other metabolic disruptions.

Salts. It makes the fresh water unusable for drinking and irrigation purposes.

- Stagnant water and other untreated water provide a habitat for the mosquito and a host of other parasites and insects that cause a large number of diseases especially in the tropical regions. Among these, malaria is undoubtedly the most widely distributed and causes most damage to human health.
- Diarrhoea kills an estimated 1.6 million children each year, caused mainly by unsafe water and poor sanitation.
- Petroleum products released in water is responsible for cancer.
- Different organic fertilizers and pesticides used in agricultural fields reach the human food chain and give birth to a large number of diseases which affect the ecosystem.

WHAT WE CAN DO TO LESSEN WATER POLLUTION

- ✓ Close taps tightly.

- ✓ Fix leaking taps and pipes at home immediately.
- ✓ Ask your parents to install new flush in toilets which uses less water.
- ✓ While brushing, washing hands or cleaning dishes do not leave the tap running.
- ✓ Don't use shower. A bucket of water will suffice for bath.
- ✓ Do not wash your car by hose. Use bucket and sponge.
- ✓ Put water to multiple uses. Like, water used for washing clothes can be reused for watering plants.
- ✓ Collect rain water that can be used for washing dishes or in gardens.
- ✓ Avoid using artificial fertilizers and pesticides in your garden for they leach into the ground and pollute water. Resort to organic gardening. Repel insects and worms by planting flowers like marigolds and pull up weeds by hand.
- ✓ Dry-cleaning solvents contain toxins which pollute water. Buy clothes made of natural fibers that can be washed at home.
- ✓ Use laundry soap instead of detergent, because they contain phosphate which, when let into rivers encourages growth of algae which uses up most oxygen, killing plants and marine life.
- ✓ Wash with unscented, uncoloured body and hand soaps. Dyes and perfumes contribute to water pollution.
- ✓ Never flush garbage down the toilet. It will ultimately appear in our rivers, lakes and other water sources.
- ✓ At home, the water should be boiled, filtered, or other methods and necessary steps taken to ensure that it is free from infection.

Quotes:

Per person consumption of water in a village in our country is about 12 liters per day. The consumption in the city is between 50-2000 liters per day.

For a cabbage seed to grow into a cabbage, about 25 liters of water is required.

NOISE POLLUTION

The word noise (Latin nausea) is usually defined as unwanted or unpleasant sound that causes discomfort. Noise pollution means as **“the unwanted sound dumped into the atmosphere leading to health hazards.”** It has many sources, most of which are associated with urban development: road, air and rail transport; industrial noise; neighbourhood and recreational noise. A number of factors contribute to problems of high noise levels, including:

- Increasing population, particularly where it leads to increasing urbanization and urban consolidation; activities associated with urban living generally lead to increased noise levels
- Increasing traffic on road, rail and air.

Although noise is a significant environmental problem, it is often difficult to quantify associated costs. It has been identified that the transport noise has four impacts as follows,

- Productivity losses due to poor concentration, communication difficulties or fatigue due to insufficient rest
- Health care costs to rectify loss of sleep, hearing problems or stress
- lowered property values
- Loss of psychological well-being.

MAIN CAUSES OF PUBLIC NOISE

Road Traffic

The impact of road traffic noise on the community depends on various factors such as road location and design, land use planning measures, building design, vehicle standards and driver's behaviour.

It is usually high in the mornings and evenings time of offices and schools.

Air traffic

The increase in the number of flights, is an important factor in overall noise levels, and has led to an increase in general noise levels associated with air traffic. Airport operations are changed to accommodate the new runway and included the introduction of new flight paths.

Rail traffic

There are two main sources of noise and vibration relating to the operation of the rail network: the operation of trains and the maintenance and construction of rail infrastructure.

The level of noise associated with rail traffic is related to the type of engine or rolling stock used, the speed of the train and track type and condition. Electric trains are generally quieter than diesel. Areas affected by freight trains often experience higher noise levels than areas affected by passenger trains.

Rail noise can be considerable, but generally affects a far smaller group of the population than road or aircraft noise as it is generally confined to residents living along rail lines in urban areas.

Neighbourhood & domestic noise

Other significant sources of noise annoyance include barking dogs, car alarms, garbage recycling, lawn-mowers, building construction and household noise. The national noise survey found that noise from barking dogs and road traffic have the greatest impact on residential communities. Noise from barking dogs is of particular concern because it is unpredictable and often happens repeatedly.

A lot of noise may happen due to loudspeakers and crackers in times of festivals and marriages.

Effects of noise

The different effects are categorized as: 1) Auditory (affecting hearing) 2) Non auditory

- a) Auditory effects: Auditory fatigue appears in 90dB and may be associated with side effects as whistling and buzzing in ears. Deafness can be caused due to continuous

exposure. Permanent loss of hearing occurs at 100dB. Mumbai and Kolkatta are the noisiest cities in the world.

- b) Non auditory: These include interference in speech communication, annoyance, loss of working efficiency, physiological disorders.

Activity disturbance is regarded as an important indicator of the community impact of noise.

- 1 People experiencing high noise levels (especially around airports or along road/rail corridors) differ from those with less noise exposure in terms of: increased number of headaches, greater susceptibility to minor accidents, increased reliance on sedatives and sleeping pills, increased mental hospital admission rates.
- 2 Physiological disorders: Exposure to noise is also associated with a range of possible physical effects including: colds, changes in blood pressure, other cardiovascular changes, Undesirable changes in respiration, increased general medical practice attendance, problems with the digestive system and general fatigue. Noise can also causes visual disturbances, reduce the depth and quality of sleep thus affect overall mental and physical health.

The police authorities have been authorized to enforce the rules regarding noise pollution. The Delhi High Court order seeking cracker manufacturers to print the noise level generated by them on the wrapper by November 2000 remains unimplemented. 20 types of crackers that exceed 125 decibels have been banned. Any person who manufactures and stores them will face prosecution. The police plans to work closely with Delhi Pollution Control Committee to help police detect the noise levels. People can complain at these control rooms, he added.

Noise control measures

The Noise Control Act 1975 deals with the prevention, minimization and abatement of noise and vibration and empowers the EPA, the Waterways Authority, local government and the police for these purposes. In areas where the state does have powers to control noise the EPA(Environmental Protection Agency) has an overall responsibility for environmental noise (as distinct from occupational noise).

- 1 The EPA controls noise from scheduled premises those required by the Noise Control Act to have a licence and noise associated with rail traffic and the construction or upgrading of freeways and toll roads.
- 2 The Police and local councils are generally responsible for neighbourhood noise issues and have authority to issue noise abatement directions to control noise from premises and for noise from burglar alarms.
- 3 Local councils have an essential role in minimising the effects of excessive noise, particularly in their local residential areas, from smaller factories, non-scheduled premises and public places. The Waterways Authority has specific responsibilities in relation to noise from vessels in navigable waters.
- 4 Proper maintenance of machinery and provision of site needs. To create vegetation cover, trees should be planted along highways, streets and other places.

At source control

This can be done by

- Controls on noise levels generated from a source (e.g. vehicle/machine design, driver/operator behaviour). Designing and fabricating silencing devices in air-craft engines, automobiles industrial machines and home appliances and home appliances and, by segregating the noisy machines.

Transmission control

- Controls on noise transmission (e.g. through the use of noise barriers). This can be achieved by covering the room walls with sound absorbers as acoustic tiles and construction of enclosures around industrial machinery.

- Measures to reduce the level of sound reaching a receiver (e.g. sound proofing sensitive or affected buildings).

To protect exposed person

- To protect exposed person, the person exposed to noise should be provided with wearing devices as ear plugs and ear muffs. Provisions of ear muffs to the workers engaged on noise generating machines

WHAT WE CAN DO TO CONTROL NOISE POLLUTION AND ITS HEATH HAZARDS

- ✓ Do not burst crackers on festivals.
- ✓ Ask your parents to install silencing devices in their vehicle.
- ✓ Plant trees in your neighbourhood.
- ✓ Use ear plugs, cotton or just put fingers in your ears in case of exposure to excessive noise if you can't move out of there.
- ✓ Avoid making too much noise while playing or in classrooms.

LAND POLLUTION & HEALTH HAZARDS

Land pollution involves the deposition on land of solid wastes like used cars, cans, bottles, plastic containers, paper-that cannot be broken down quickly or, in some instances, cannot be broken down at all by the action of organic or inorganic forces. Every single day, tons and tons of domestic waste ranging from fish bones to huge pieces of rubbish such as unused refrigerator. If all these wastes are not disposed of properly, the damage they can do to the environment and humankind can be extremely devastating.

While waste collected from homes, offices and industries may be recycled or burnt in incinerators, a large amount of rubbish is neither burnt nor recycled but is left in certain areas marked by the government as dumping grounds. With the rising standards of living and consumerism, we throw away more things and there is an increase in the quantity of solid waste. Solid waste materials pose a serious threat because the polluting material remains in dumped place for a long time unless removed, burnt, washed away or otherwise destroyed.

CAUSES OF LAND POLLUTION

1. **INDUSTRIAL WASTE** – It includes any discharged solid

material which results from industrial operations. The

Composition and quantity of industrial solid

wastes vary significantly from location

as well as between industries and within

a given industry. Approximately 1

million tons of solid waste is generated from

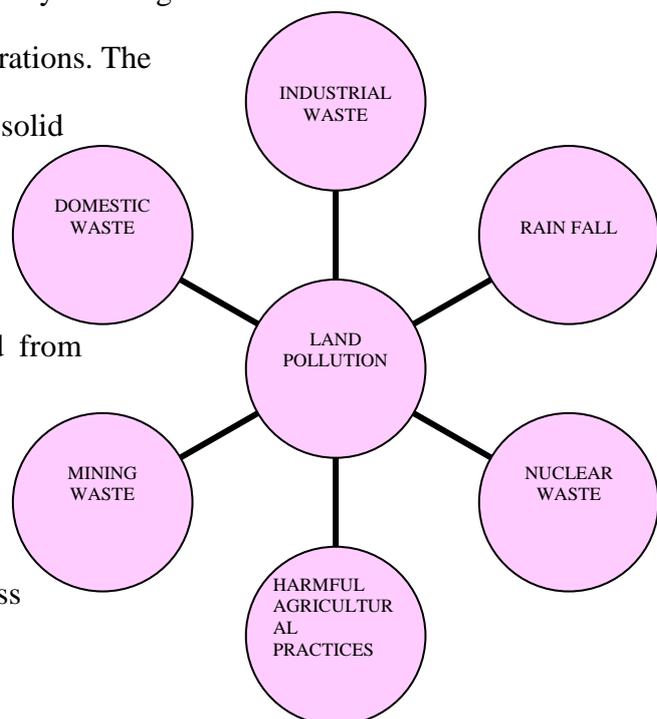
these units. Nearly 22% of industrial

wastes are hazardous. It has been

calculated that

about 94% of these wastes are process

oriented



(Generated between processing of raw materials to get finished products), and 6% of it is pollution control oriented

(Generated from treatment of gaseous and liquid effluents).

2. **MINING WASTE** – excessive and uncontrolled mining affects the landscape in diverse ways, depending on the type of material excavated, material overburden ratio, type of excavation and topography. Massive land pollution is evidently unavoidable in case of large scale mechanized open cast mining. Mining destroys natural vegetation and agricultural operations, leaves an aesthetically repugnant legacy and disturbs the natural ground ecology.

3. **HARMFUL AGRICULTURAL PRACTICES** – over cultivation deplete the organic matter and nutrient content of the soil. Causing loss of fertility, leaving it exposed to the eroding forces of the sun and wind. The soil becomes as dry as dust and blows away with wind. The remaining sub soil may become hard and impervious. It can no longer absorb rain and gets eroded with water.

Due to insufficient implementation of irrigation or over irrigation, in course of time, the former fertile soil is converted to water-logged and marshy land. Thus, irrigation can do more harm than good if water is not allowed to drain from the soil.

Excessive use of fertilizers to increase the productivity, may lead to loss of nitrogen content of soil and ground water in proportionately higher quantity and many a time are likely to become quite serious to affect crop production, in addition to new environmental health hazard. A part of nitrate and phosphate fertilizer, which is not utilized by the crop, is washed into fresh water aquifer during the rainy season.

4. **NUCLEAR WASTES** – many countries today face a serious problem of where to dispose off the enormous amount of nuclear waste generated by their nuclear power stations. Nuclear waste dumps have been disposed of at the bottom of very deep ocean regions.

5. **DOMESTIC WASTES** – Delhi alone is generating more than 8000 tones of solid waste daily. This also includes 460 tonnes of plastic waste and more than 50 tonnes of medical waste. The quantity of waste increases with population, urban slums and rise in consumerist pattern of living.

In recent times there has been great increase in e-waste which includes items of electronic use like cell phone, television sets and used refrigerators.

Unintentional poisonings kill an estimated 355 000 people globally each year (1). In developing countries – where two thirds of these deaths occur – such poisonings are associated strongly with excessive exposure to, and inappropriate use of, toxic chemicals. In many such settings, toxic chemicals may be emitted directly into soil, air, and water – from industrial processes, pulp and paper plants, tanning operations, mining, and unsustainable forms of agriculture – at levels or rates well in excess of those tolerable to human health (2,3,4).

Good management, use, and disposal of agrochemicals – particularly pesticides – is an important health and environment issue in developing countries – where economies may be heavily reliant on agriculture. Acute exposure to pesticides can lead to death or serious illness (6). Chronic pesticide exposure is most often a problem in the occupational setting, particularly among poor rural populations where men, women, and children all work and live in close proximity to fields and orchards where chemicals are applied and stored (4,7).

Long-term exposure to pesticides can increase the risk of developmental and reproductive disorders, immune-system disruption, endocrine disruption, impaired nervous-system function, and development of certain cancers. Children are at higher risk from exposure than are adults (6,7,3,2).

Pesticides, when not judiciously used, may disrupt natural biological pest control mechanisms. More vigorous pest attacks may result, along with heavier chemical use, and increased health exposures. Pesticides, as well as fertilizers, can infiltrate water sources – contaminating drinking water and animal species, e.g. fish, upon which humans rely for nutrition. Such contamination can lead to a range of secondary public health impacts (7,8).

. Risks and problems associated with solid wastes

If solid wastes are not managed properly, there are many negative impacts that may result. Some of the most important are mentioned in the following list. The relative importance of each depends very much on local conditions.

- 1 Uncollected wastes often end up in drains, causing blockages which result in flooding and insanitary conditions.
- 2 Flies breed in some constituents of solid wastes, and flies are very effective vectors that spread disease.
- 3 Mosquitoes breed in blocked drains and in rainwater that is retained in discarded cans, tyres and other objects. Mosquitoes spread disease, including malaria and dengue.

Plastic bags are a particular aesthetic nuisance and they cause the death of grazing animals which eat them.

- 1 Dangerous items (such as broken glass, razor blades, hypodermic needles and other healthcare wastes, aerosol cans and potentially explosive containers and chemicals from industries) may pose risks of injury or poisoning, particularly to children and people who sort through the waste.
- 2 Waste items that are recycled without being cleaned effectively or sterilised can transmit infection to later users. (Examples are bottles and medical supplies.)

Radiation Pollution

Radioactive Pollution

Among the hazardous substances, radioactive substances are the most toxic. As compared to organic poisons, injurious effects of radio nuclides are exceedingly high. For instance, radium is 25,000 times more lethal than arsenic. Nuclear war materials, test explosions, mad rush for power plants and radioisotope use in medicine, industry and research are the main source of radioactive pollution that could threaten our environmental security.

Natural sources

1)cosmic rays 2) environment(rocks, water, air) 3) living organisms

Man made sources

1)X-rays machines 2) nuclear reactor wastes 3)industrial, medical and research uses of radioactive materials 5) miscellaneous

Biological Effects

Radioactive substances are among the most toxic substances known.

- 1 It has direct effect on cells and tissues.
- 2 High toxicity can kill animals. The victim declines in vitality and dies from anemia, infection and haemorrhage.
- 3 Delayed effects- eye cataract, leukemia, malignant tumors, cardiovascular disorders, premature ageing and reduced life span.
- 4 Increase the rate of mutation, genetic damage occur.

Surface waters are a powerful factor that causes migration of radionuclides. For this reason it is essential to take into due account the transit role of rivers in the transportation of radionuclides, including transboundary transfer. In watercourses and flowing water bodies concentration of radionuclides are reducing every year, but they tend to accumulate in static water bodies (lakes, ponds, reservoirs, especially in bottom sediments).

Due to the accident at the Chernobyl nuclear power station (CNPS) one quarter of the country's territory was contaminated by caesium-137 (23%), strontium-90 (10%) and plutonium (about 2 %).

The ratio between concentrations of caesium-137 and strontium-90 at the end checkpoints of the Braginka and Senna Rivers suggests that starting from 1992-1993, the concentration of strontium-90 has begun to exceed that of caesium-137. That phenomenon is characteristic for surface watercourses close to the CNPS zone and is explained by an increase in migration ability of strontium-90 due to its release from active particles.

Ultraviolet radiation and health

What is UV radiation?

Everyone is exposed to UV radiation from the sun and an increasing number of people are exposed to artificial sources used in industry, commerce and recreation. Emissions from the sun include visible light, heat and UV radiation.

The UV region covers the wavelength range 100-400 nm and is divided into three bands:

- UVA (315-400 nm)
- UVB (280-315 nm)
- UVC (100-280 nm).

As sunlight passes through the atmosphere, all UVC and approximately 90% of UVB radiation is absorbed by ozone, water vapour, oxygen and carbon dioxide. UVA radiation is less affected by the atmosphere. Therefore, the UV radiation reaching the Earth's surface is largely composed of UVA with a small UVB component.

Ozone depletion and UV-related health effects



Depletion of the ozone layer is likely to aggravate existing health effects caused by exposure to UV radiation, as stratospheric ozone is a particularly effective UV radiation absorber. As the ozone layer becomes thinner, the protective filter provided by the atmosphere is progressively reduced. Consequently, human beings and the environment are exposed to

higher UV radiation levels, and especially higher UVB levels that have the greatest impact on human health, animals, marine organisms and plant life.

Computational models predict that a 10% decrease in stratospheric ozone could cause an additional 300,000 non-melanoma and 4500 melanoma skin cancers and between 1.6 and 1.75 million more cases of cataracts worldwide every year.

Ionizing radiation

Ionizing radiation has always been a part of the human environment. Along with natural radioactive sources present in the Earth's crust and cosmic radiation, man-made sources also contribute to our continuous exposure to ionizing radiation.

Environmental radioactive pollution has resulted from past nuclear weapons testing, nuclear waste disposal, accidents at nuclear power plants, as well as from transportation, storage, loss, and misuse of radioactive sources. While there are risks associated with exposure to radiation benefits of nuclear applications in medicine industry and science are well established. WHO's radiation programme aims to assure that the benefits of radiation technology far exceeds any known risks.

WHO's Ionizing Radiation Programme

- 1 The Radiation and Environmental Health Programme within the WHO's Sustainable Development and Healthy Environments Cluster, evaluates health risks and public health issues related to environmental and occupational radiation exposure.
- 2 The aim of the Radiation and Environmental Health Programme is to look for solutions to protect human health from ionizing radiation hazards by raising people's awareness of the potential health risks associated with ionizing radiation, and the importance of its safe and rational management.
- 3 Through promoting research and providing recommendations for emergency medical and public health responses to radiation accidents and terrorist acts, and providing advice to national authorities, we hope to enable national and local public health authorities to deal with radiation exposure issues effectively, facilitating key research programmes and providing sound advice.

FOOD ADULTRATION AND HEALTH HAZADS

Large number of our population is not quite aware about food adulteration as much as they are about environmental pollution. One of the reasons of being not aware could be, not including it in environmental pollution. Food adulteration is a sort of indirect environmental pollution and has major health hazards. It might be lethal. Definitely, it should be included in environmental pollution so that people become informed, aware and more inquisitive about it.

WHAT IS ADULTERATED FOOD?

An article of food shall be deemed to be adulterated -

- if the article sold by a vendor is not of the nature, substance or quality demanded by the purchaser or which it supposed to be;
- b if the article contains any substance affecting its quality or of it is so processed as to injuriously affect its nature, substance or quality;
- if any inferior or cheaper substance has been substituted wholly or partly for the article, or any constituent of the article has been wholly or partly abstracted from it, so as to affecting its quality or of it is so processed as to injuriously affect its nature, substance or quality;
- if the article had been prepared, packed or kept under unsanitary conditions whereby it has become contaminated or injurious to health;
- if the article consists wholly or in part of any filthy, putrid, disgusting, rotten, decomposed or diseased animal or vegetable substance or being insect-infested, or is otherwise unfit for human consumption;
- if the article is obtained from a diseased animal;
- if the article contains any poisonous or other ingredient which is injurious to health;
- if the container of the article is composed of any poisonous or deleterious substance which renders its contents injurious to health;
- if the article contains any prohibited colouring matter or preservative, or any permitted colouring matter or preservative in excess of the prescribed limits;

- if the quality or purity of the article falls below the prescribed standard, or its constituents are present in proportions other standard, or its constituents are present in proportions other than those prescribed, whether or not rendering it injurious to health.

FOOD ADULTURATION :- The deliberate contamination of food materials with low quality, cheap, non-edible or toxic substances is called food adulteration. While the substance that degrades or lowers the quality of food is an adulterant.

Sweets

Attractively decorated sweets and other edible items may not be that attractive for your internal organs as they may be for the eyes. Non permissible and banned colours like Metanil, yellow a non-permitted coal tar dye commonly known as 'Kishori Rang', Rhodamin-B, Lead Chromate or Ultra Marine Blue may be mixed in those sweets. They cause serious health hazards and may also lead to cancer in the long run. They are carcinogenic. Metanil yellow dye which is another non-permissible toxic colorant, is used mostly to color Besan or gram flour, pulses, miscellaneous prepared foods namely sweetmeats like laddoo, burfi, jelabi, dalmoth, papad, etc. to get that attractive deep yellow color.

Milk

Milk has been eulogized as the best nutrition for children's growth and to replenish energies of adults. From time immemorial it has been considered sacred and most pious of all fluids. However, this too did not spare milk of adulteration. Common adulteration is addition of water, flour, or any other starchy material say industrial starch. Addition of water and extraction of fat is very common and not harmful. However, dirty water and starch may lead to ulcers and stomach problems But what when the milk you drink is not milk at all? Rather combination of urea, liquid detergent, a little sugar, vegetable oil and water... Synthetic Milk! There was a case in Delhi, where the racket was busted a few years back and there was a lot of hue and cry in the media regarding the same. What a havoc it must have done within people who consumed it. And there is no guarantee that this synthetic milk is not being supplied any more!!

Turmeric

Turmeric is the basic masala for all our Indian cooking. It may be adulterated with Lead chromate, (which adds color as well as weight to it, being heavier), Metanil Yellow dye or any starch based items like flour or rice powder or even industrial starch. Except flour or rice powder, all the other adulterants are health hazardous and cause irreparable damage to our system when eaten at regular intervals for a long period of time Lead chromate is one of the most toxic salts of lead. It can cause anemia, paralyses, mental retardation and brain damage in children and abortion in pregnant women.

One does not know what the common adulterants are; take for instance, for coriander powder or chili powder- sawdust, rice bran and sand. What one cannot fathom is adulteration with horse-dung and cow-dung! This is not only unethical, from the business point of view, but a sin committed against the society at large.

Puffed rice or other white coloured eatable looks dazzling and bright and attractive because they have been treated by ultra marine blue a chemical dye which is a non-permissible and prohibited. And for Rhodamin-B - rich deep pink color (Gulaabi) is again a non-permissible colorant. This colorant has also proven to be carcinogenic.

MUSTARD

Argemone seeds that grow as weeds in the mustered fields are mixed with mustered seeds and its oil is mixed with mustered oil. Just a trace amount is all right, but when added deliberately it causes serious health hazards and even death. Dropsy is a straight after effect of consumption of this oil. It may also cause swelling, irregular fever, low pulse rate, enlargement of the liver, respiratory distress which may lead to heart failure.. It is very harmful and hazardous to health when mixed with crude castor oil, industrial palmolein-oil, mineral oils etc. This is certainly a crime against humanity aimed at earning money at the cost of public health.

SOME OTHER FORMS OF COMMON FOOD ADULTRATION ARE:

- Ghee is adulterated to the extent of 80 to 85 percent with Vanaspati . In actuality it is Vanaspati flavored with 15 or 20 percent of ghee by special process.

- Sand, dirt, earth, gritty matter, soap stone, common salt are added to flour, refined flour (maida), gram flour (besan), spices, sugar, tea-dust and coffee.
- Washing soda is added to table salt.
- In tea-dust one can even find iron filings.
- The lovely silver leaves (barak) used to decorate sweets and pan, may be aluminum leaf or foil, which is again very bad for health, causing a lot of physical complications.
- Dried seeds of volatile oil are added to cloves, while mineral acids to vinegar, papaya seeds to black pepper.
- Aniseed or 'sauf' that after food refreshment is dyed with malachite green dye for that nice green color. In food grains and whole spices extraneous matter like stalks, stems, and foreign seeds are added.
- Castor oil which is often mixed in ground nut oil can cause abortion in cases of pregnant women.
- Khesari Dal which is often mixed in Arhar Dal can cause lower limb paralysis known as Lathyrism. Lathyrus sativus species (Khesari Dal) has a toxic Amino acid known as Beta oxalyl amino alanine which is responsible for the above condition.

THE LEGAL PROVISION

The Prevention of Food Adulteration Act, 1954 aims at making provisions for the prevention of adulteration of food.

STEPS TO PROTECT YOURSELF AGAINST FOOD ADULTURATION

- ✓ Avoid buying loose edible items from the markets, and go for tinned or packed items on which proper informative labels are displayed, which includes the date of manufacture and expiry as well.
- ✓ Stress on products with F.P.O., I.S.I. or AGMARK certifications. These are the most commonly used certifications and at least give the consumers third party guarantee of the product.