# “MAA” OMWATI COLLEGE OF EDUCATION HASSANPUR (PALWAL)

AFFILIATED CRS UNIVERSITY, JIND

Notes

B.P.Ed.- Semester-1st (2021-22)
Health Education and Environmental Studies

E-mail: moce.principal@maaomwati.com

## HEALTH EDUCATION AND ENVIRONMENTAL STUDIES

## UNIT: 01

**INTRODUCTION:** “Health is Wealth” Health is not just absence of disease but a state of overall wellbeing. In 1948, the World Health Organization (WHO) defined health with a phrase that is still used today. "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." Health is a state of physical, mental and social well-being. It involves more than just the absence of disease. Physical fitness is a good bodily health and is the result of regular exercise, proper diet, nutrition and proper rest for physical recovery

**MEANING AND DEFINITION OF HEALTH:** As defined by World Health Organization (WHO), it is a "State of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity." Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." 1948. "A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. Health is the state of being bodily and mentally vigorous and free from disease. A person's health is the condition of their body and the extent to which it is free from illness or is able to resist illness.

**Concepts of Health**

• **Biomedical Concept** (Health has been viewed as an “absence of disease”, and if one was free from disease the person was considered healthy)

• **Ecological Concept** (Health implies the relative absence of pain and discomfort and a continuous adaptation and adjustment to the environment to ensure optimal function)

• **Psychosocial Concept** (Health is both a biological and social phenomenon)

• **Holistic Concept** (A sound mind in a sound body, in a sound family, in a sound environment; All sectors of society like agriculture, animal husbandry, food, industry, education, housing, public works, communication & other sectors have an effect on health).

**New Philosophy of Health**

- Health is a fundamental Human Right
- Health is the essence of productive life
- Health is inter sartorial
- Health is an integral part of development
- Health is central to the concept of quality of life
- Health involves individuals, state and international responsibility
- Health & its maintenance is a major social investment
- Health is a worldwide social goal

**DIMENSIONS OF HEALTH:** Wellness is much more than merely physical health, exercise or nutrition. It is the full integration of states of physical, mental, and spiritual well-being. The model used by our campus includes social, emotional, spiritual, environmental, occupational, intellectual and physical wellness. There are five main aspects of personal health: physical, emotional, social, spiritual, and intellectual. In order to be considered "well," it is imperative for none of these areas to be neglected. The Seven Dimensions of Wellness: Physical.

- Emotional.
- Intellectual.
- Social.
- Environmental.
- Occupational.

**SPECTRUM AND DETERMINANTS OF HEALTH:** Spectrum Health and Priority Health. Spectrum Health, an integrated health system based in Grand Rapids, Mich., has focused on transparency both as a provider of health care, through the Spectrum Health network of hospitals and clinics, and as a player, through Priority Health, the system's health plan. Health factors in the County Health Rankings represent what influences the health of a county. We measure four types of health factors: health behaviors, clinical care, social and economic factors, and physical environment. In turn, each of these factors is based on several measures. The followings are the determinants of health-:

- Biology and genetics. Examples: sex and age.
- Individual behavior. Examples: alcohol use, injection drug use (needles), unprotected sex, and smoking.
- Social environment.
- Physical environment
- Health services.

## Types of Health

1. **Physical Health**: It means the condition of a physical body and how suitable it is to function considering its all parts with flexibility. It is affected by sufficient intake of nutrition, physical activity, rest, and environment zones where the person is residing or at the place. It encourages us to take proper care of the body in terms of strength and endurance. One should intake nutrition, a balanced diet, and plenty of water to help achieve the body’s physical fitness.
2. **Mental Health**: The psychological state should be maintained at an appropriate level of emotional adjustments and the behaviour being shown. Good mental health does not mean free of illness; it indicates how the stress and relationships are managed,

which could be done by instilling a sense of confidence, optimism, acknowledgement of being oneself, performing yoga and exercises.

3. **Social Health**: It is the state of being friendly and interactive with others and pursuing different situations with calmness and happiness. Strong social relations help foster communities at all levels.

4. **Environmental Health:** It is essential to know how the environment and surroundings (things in the natural environment such as air, water and soil, physical, biological, chemical and social features) affect human health. The National Institute of Environmental Health Science states that the environment consists of lifestyle factors, namely diet and exercise, socio-economic position and other societal influences that could impact health accordingly.

5. **Spiritual Health:** It sets the aim and purpose of life in understanding beliefs, morals and ethics. According to the National Wellness Institute, one should respect, tolerate others' opinions, and live with values that remain with oneself while being true to yourself. Religious faith principles also affect spirituality, and the inner calm to survive and thrive in every situation of predicament should remain consistent. For instance, one should meditate; spend their time in nature, walk and cycle for a particular period.
6. **Occupational Health:** Occupational health is an area of work in public health to promote and maintain highest degree of physical, mental and social well-being of workers in all occupations. Its objectives are:

    1. The maintenance and promotion of workers' health and working capacity;
    2. The improvement of working conditions and the working environment to become conducive to safety and health;
    3. The development of work organization and working cultures that should reflect essential value systems adopted by the undertaking concerned, and include effective managerial systems, personnel policy, principles for participation, and voluntary quality-related management practices to improve occupational safety and health.

The science and practice of occupational health involves several disciplines, such as occupational medicine, nursing, ergonomics, psychology, hygiene, safety and other.

- Develop national policies and action plans and to build institutional capacities on occupational health,
- Scale up the coverage with essential interventions for prevention and control of occupational and work-related diseases and injuries and occupational health services
- Ensure in collaboration with other relevant national health programs such as those dealing with communicable and non-communicable diseases, prevention

of injuries, health promotion, mental health, environmental health, and health systems development.

**HEALTH EDUCATION:** Health education is any combination of learning experiences designed to help individuals and communities improve their health, by increasing their knowledge or influencing their attitudes. Health education is a profession of educating people about health. Health education can be defined as the principle by which individuals and groups of people learn to behave in a manner conducive to the promotion, maintenance, or restoration of health. Health education teaches about physical, mental, emotional and social health. It motivates students to improve and maintain their health, prevent disease, and reduce risky behaviors. Health education curricula and instruction help students learn skills they will use to make healthy choices throughout their lifetime.

**HEALTH INSTRUCTION:** Health education teaches about physical, mental, emotional and social health. It motivates students to improve and maintain their health, prevent disease, and reduce risky behaviors. Health education curricula and instruction help students learn skills they will use to make healthy choices throughout their lifetime. To provide emergency care for illness or injury while at school, to ensure that all students get appropriate referrals to health care providers, to monitor for and control the spread of communicable disease, to provide education and counseling in a variety of health and wellness topics, to serve as a medical resource. Health education is that body of knowledge which includes all experiences both formal (planned instructions) and informal (incidental knowledge) which favorable influence knowledge, attitude and practice as regards individual or community health. On the other hand, health instruction is a formal form of interaction where health concept (content to improve knowledge, attitude and practice) are taught with the aim of influencing these domains of learning positively to ensure that people are equipped with relevant information and act positively in matters of health.

**HEALTH SUPERIVISION:** On construction sites large and small, supervision has a key role to play in preventing accidents. Typical supervisory functions include planning and allocating work, making decisions, monitoring performance and compliance, providing leadership and building teamwork, and ensuring workforce involvement. Health supervision, health teaching, counseling, or monitoring the status of a patient’s health other than for physical care. Such supervision occurs in health care agencies, clinics, physicians' offices, or a patient's home. Compare care of the sick. Supervision program is a comprehensive home visiting program for new teen. mothers and their babies. The program provides a variety of physical and. emotional health services for teens and children until they are age 3. The improvement of teaching and learning is the general purpose of supervision. A basic premise of supervision is that a teacher's instructional behavior affects student learning. An examination of instructional behaviors can lead to improvement in teaching and learning.

**AIMS AND OBJECTIVES OF HEALTH EDUCATION:** The purpose of health education is to positively influence the health behavior of individuals and communities as well as the living and working conditions that influence their health. Health Education helps people in solving their health problems

using their potential and establishes proper health behavior and the wrong change to true healthy behavior. The ultimate goal of health education is: Improve the health of the individual and community level. Health education builds students' knowledge, skills, and positive attitudes about health. Health education teaches about physical, mental, emotional and social health. It motivates students to improve and maintain their health, prevent disease, and reduce risky behaviors. The aim of World Health Day 2005 is to create momentum that compels governments, the international community, civil society and individuals to take action to improve the health and well-being of mothers and children – and especially to help save the lives of millions of mothers and children who are dying each year during childbirth and early childhood. The main objectives of World Health Day 2005 are to:

- Raise awareness of the extent of illness, suffering and death among mothers and children, and its impact on health as well as social and economic development.
- Increase understanding that solutions exist. Affordable and effective means are known that can prevent death and suffering. The challenge is to deliver a key set of preventive and curative interventions to the mothers and children who need them – to translate knowledge into action.
- Generate a movement that stimulates collective responsibility and action. Families, community based groups, professional societies, national governments, and the international community all need to support the delivery of programs and services to mothers and children, as well as fight for better access to basic health services. Every individual within society has a role to play.
- To increase knowledge of the factors that affect health.
- To encourage behavior which promote and maintains health.
- To enlist support for public health measures, and when necessary, to press for appropriate governmental action.
- To encourage appropriate use of health services especially preventive services.
- To inform the public about medical advances their uses and their limitations.

**PRINCIPLES OF HEALTH EDUCATION:** Health Supported by the latest knowledge from research Education. The followings are the principles of Health Education-:

- A systematic, comprehensive and consistent activity.
- Adapted to age, gender, education and particular health, mental or social problems of an individual or community.
- Encourages personal investment of an individual.
- Respects environment/culture of an individual
- Health education must be imported in a interesting manner.
- Learner must feel comfortable and willing to participate in school healthy programs. Therefore proper motivation and interest should be aroused in students.
- In health education, positive statements like Be Clean area preferable, there should not be negative statements like do not remain dirty, positive statements are effective and workable than negative statements.
- Health education is better understood if imparted in practical situations. Practically experiencing healthy programs develop more interest and learning.

- Subject matter imparted in healthy education must be classified according to the age group. Topic suitable for higher secondary students may be very difficult for elementary students like Topic on Aids, Cancer etc.
- Language used must be easy and understandable so that better communication will take place and students can easily make their doubts clear.
- Health Education based on need of the hour
- Sometimes situation may not permit to adopt health habits quickly, therefore effective health educational process will only take place when individual attention and reasonable time is given to the same person. Punishment must not be given to students if one is unable to adopt health education practically.
- Health education is against the competitive spirit. No two individuals could be alike in posture and no single posture is said to be best. Therefore, there should not be any kind of competitive spirit; this may lead to unhealthy competition and use of unfair means.
- Providing motivation is the most necessary part of health education, for practicing health programs in life style.
- It is duty of every individual to contribute in the health of community. Not only physical teachers, every general teacher and student are involved in the health educational guidance and counseling programs.
- Health Education is a Systematic and Continues efforts
- In many education institutions, health education includes the knowledge of 'sex education' and many times it was protested by some people as they declare this topic 'non-educational'. Now a day's society has accepted 'health education' as important discipline, but then also the knowledge imparted to students must" be acceptable to local community.

**HEALTH SERVICE AND GUIDANCE INSTRUCTION IN PHYSICAL HYGIENE:** Good personal hygiene is essential to promoting good health. Personal hygiene habits such as washing your hands and brushing and flossing your teeth will help keep bacteria, viruses, and illnesses at bay. And there are mental as well as physical benefits. If you want to minimize your risk of infection and also enhance your overall health, follow these basic personal hygiene habits:

- Wash your body and your hair often
- Keeping your finger and toenails trimmed and in good shape will prevent problems such as hang nails and infected nail beds. Feet that are clean and dry are less likely to contract athlete's foot
- Ideally, you should brush your teeth after every meal. At the very least, brush your teeth twice a day and floss daily. Brushing minimizes the accumulation of bacteria in your mouth, which can cause tooth decay and gum disease, Novey says. Flossing, too, helps maintain strong, healthy gums.
- Washing your hands before preparing or eating food, after going to the bathroom, after coughing or sneezing, and after handling garbage, goes a long way toward preventing the spread of bacteria and viruses.
- Keep a hygiene product, like an alcohol-based sanitizing gel, handy for when soap and water isn't available.

- Get plenty of rest — 8 to 10 hours a night — so that you are refreshed and are ready to take on the day every morning.
- Take proper nutritional diet regularly.
- Washing the hair with soap or shampoo at least once a week.
- Washing hands with soap after going to the toilet.
- Washing hands with soap before preparing and/or eating food. During normal daily activities, such as working and playing, disease causing germs may get onto the hands and under the nails. If the germs are not washed off before preparing food or eating, they may get onto the food.
- Changing into clean clothes. Dirty clothes should be washed with laundry soap before wearing them again.
- Hanging clothes in the sun to dry. The sun's rays will kill some disease-causing germs and parasites
- Turning away from other people and covering the nose or mouth with a tissue or the hand when coughing or sneezing. If this is not done, droplets of liquid containing germs from the nose and mouth will be spread in the air and other people can breathe them in, or the droplets can get onto food.

**CONCLUSION:** Maintaining personal hygiene is essential for more than one reason; social, health, personal, psychological or just as a way of life. Maintaining a good standard of hygiene helps keep you by infections, illnesses and bad odors away. One personal benefit of good hygiene is having better health. Keeping your body clean helps prevent illness and infection from bacteria or viruses. Like in our example, the simple act of washing your hands regularly is an effective way to keep germs from spreading. Personal hygiene is a necessity of life. In a healthcare job, it is especially important to stay clean and take care of your personal hygiene. After all, staying clean helps maintain a healthy environment for your patients. In fact, poor hygiene can lead to the spread of disease.

**UNIT: II**

**INTRODUCTION:** The life expectancy at birth has increased from 49.7 years in 1970-1975 to 67.9 years in 2010-2014. For the same period, the life expectancy for females is 69.6 years and 66.4 years for males. In 2018, the life expectancy at birth is said to be 69.1 years. As per the figures about the child mortality rate which is quite a big hurdle for the government, the 2nd most common cause of DALYs lost for children under 5 years of age was diseases like diarrhea, lower respiratory tract infections and other communicable diseases (accounting for 22,598.71 DALYs per 100 000 population) as of 2016 which can be preventable. Maximum cases are due to Health problem. These major health problems include lung diseases and disorders, gastrointestinal disorders and heart disease and diabetes. The causes for the disorders vary. Highly prevalent and toxic air pollution leads to or exacerbates lung disorders. Improper hygiene and sanitation causes gastrointestinal disorders.

**COMMUNICABLE AND NON-COMMUNICABLE DISEASES:** A disease is any abnormal condition that causes a disruption in the functions of a body tissue, organ, or entire organism. Diseases are recognized by a specific set of symptoms. Think about the diseases you know: a cold, the flu, measles, cancer, stroke, or diabetes, just to name a few. These diseases all disrupt the body in very characteristic ways. Now think about what causes these conditions: viruses, bacteria, fungi, smoking, genetic defects, etc. There are countless diseases, each with its own unique and characteristic cause. But why can you 'catch' some diseases but not others? This is due to the two different types of disease: communicable and non-communicable.

**Communicable diseases** are spread from person to person or from animal to person. Thespread or transfer can happen through the air, through contact with contaminated surfaces, or through direct contact with blood, feces, or other bodily fluids. A cold is an example of a communicable disease (a cold is the general term given to a viral infection of the upper respiratory tract).

**Non-communicable disease** (NCD) is a disease that is not transmissible directly from one person to another. NCDs include Parkinson's disease, autoimmune diseases, strokes, most heart diseases, most cancers, diabetes, chronic kidney disease, osteoarthritis, osteoporosis, Alzheimer's disease, cataracts, and others.

**OBESITY:** Obesity is an epidemic in the United States. This condition puts people at aϖ higher risk for serious diseases, such as type 2 diabetes, heart disease, and cancer. he most common causes of obesity are overeating and physical inactivity. Ultimately, body weight is the result of genetics, metabolism, environment, behavior, and culture. A person is more likely to develop obesity if one or both parents are obese. Obesity results from a combination of causes and contributing factors, including individual factors such as behavior and genetics. Behaviors can include dietary patterns, physical activity, inactivity, medication use, and other exposures. Dietary changes to treat obesity include: Cutting calories. The key to weight loss is reducing how many calories you take in. You and your health care providers can review your typical eating and drinking habits to see how many calories you normally consume and where you can cut back.

**MALNUTRITION:** Malnutrition is a condition that results from eating a diet in which oneϖ or more nutrients are either not enough or are too much such that the diet causes health problems. It may involve calories, protein, carbohydrates, vitamins or minerals. slower immune response which increases the risk of getting infections, and increases the length of time that it takes to recover from infection, difficulty staying warm as a result of having less muscle and tissue mass, increasing the risk of hypothermia (the inability to maintain normal body temperature)

**There are two major types of malnutrition:**

- Protein-energy malnutrition - resulting from deficiencies in any or all nutrients.
- Micronutrient deficiency diseases - resulting from a deficiency of specific micronutrients.

**Signs and symptoms of under nutrition include:**

- Lack of appetite or interest in food or drink.
- Tiredness and irritability.
- Inability to concentrate.
- Always feeling cold.
- Loss of fat, muscle mass, and body tissue.
- Higher risk of getting sick and taking longer to heal.
- Longer healing time for wounds.

**Malnutrition Treatment:** A dietitian will advise about dietary changes that can help. They may create a tailored diet plan that ensures the person gets enough nutrients. They may also suggest:

- having a healthier, more balanced diet
- eating "fortified" foods that contain extra nutrients
- snacking between meal
- having drinks that contain lots of calories
- getting home supermarket deliveries

**ADULTERATION IN FOOD:** Adulteration is a legal term meaning that a food productϖ fails to meet the legal standards. One form of adulteration is an addition of another substance to a food. Methods of detecting food adulteration are based on physical, chemical, biochemical, and other techniques. All these methods, which have replaced the early organoleptic and other empirical tests, are continuously updated because food adulteration is unceasing, and new problems are always arising. A number of analytical procedures are usually available for most cases of adulteration so that the analyst has the flexibility to choose the appropriate one (number of samples to be analyzed, sensitivity required, etc). Food is adulterated to increase the quantity and make more profit. The technical definition of food adulteration according to the Food and Safety Standards Authority of India (FSSAI) is, "The addition or subtraction of any substance to or from food, so that the natural composition and quality of food substance is affected." In India normally the contamination/adulteration in food is done either for financial gain or due to carelessness and lack in proper hygienic condition of processing, storing,

transportation and marketing. Adulteration has taken away the joy of life. Now everything you like may or may not have fallen prey to the locus of adulterants. We see grey but it turns out to be black and white. We are trapped in an illusion where the everyday use items are now all messed up. This ultimately results that the consumer is either cheated or often become victim of diseases. Such types of adulteration are quite common in developing countries or backward countries. According to the Journal of Food Science , "Olive oil, milk, honey, saffron, orange juice, coffee and apple juice are the seven most likely food ingredients to be targets for intentional or economically motivated adulteration of food."

- **Milk:** Milk is possibly one of the easiest targets and that's why you'll find hundreds of cases where food authorities or independent food testing agencies have found milk to be adulterated.
- **Honey:** Honey is often adulterated with water and table sugar to increase the bottle' quantity.
- Spices: spices like turmeric powder are also adulterated with ‘metanil yellow’. ‘Metanil yellow’ is produced with utilizing some raw materials like ‘metanilic acid’ and ‘diphenylamine’. The common people do not know the risk of consuming turmeric powder mixed with ‘metanil yellow’. It is purely carcinogenic – means it is capable of causing cancer in living tissues. In black pepper adulterant is Papaya seeds (used to add bulk).It’s harmful effect is that Papaya seeds can cause serious liver problems and stomach disorders. Chili powder is often adulterated with a similar looking substance like brick powder.
- **Ice Cream:** In ice Cream adulterant is pepper oil, ethyl acetate; butraldehyde, emil acetate, nitrate, washing powder etc are not less than poison. Pepper oil is used as a pesticide and ethyl acetate causes terribble diseases affecting lungs, kidneys and heart.
- **Food grains and Flour:** The rice and wheat is a part of our staple food in India. The powdered rice and wheat is usually adulterated with starch. This is done to thicken the cream. This added substance takes away the nutrition intended for the consumer leaving us under the illusion that our diet is perfect. Rice is being adulterated with small ‘grains of stones’ to increase the overall weight per quintal by unscrupulous retailers.
- **Coffee powder:** The coffee powder usually adulterated Tamarind seeds, chicory powder (used to add bulk and color). Its harmful effect is that it can cause diarrhea, stomach disorders, giddiness and severe joint pains.
- **Tomato sauces:** Tomato sauces mostly used in local fast food centers in numerous areas of West Bengal, are also artificially made from ‘pumpkin pulp’, ‘sugar’, ‘non-edible colours and flavours’. No tomato is present in that sauce to maintain very cheap rate in the local market. These sauces with ‘artificial colours and flavours’ are highly carcinogenic. These are being supplied rampantly without the checking of the health department.
- **Tea Leaves:** Tea leaves are often adulterated with chemicals and additives that add to its aroma or flavour. Many substances have been used to adulterate tea. Ordinary substances for adulterating tea include, but are not limited to: Prussian blue — a no soluble, blue pigment commonly used to color blueprints, crayons, paintings, and paint; it is non-toxic to humans.
- **Vegetable Oils and Ghee:** In Mustard seeds and mustard oil adulterant is Argemone seeds (used to add bulk and weight).Papaya seeds (used to add bulk) that the consumption of these could cause epidemic dropsy and severe glaucoma. Young children and senior citizens with poor immunity are more susceptible this.

- **Diwali Sweets:** Khoya and Chhena are commonly used for the preparation of traditional. Diwali sweets, and are often adulterated with starch. All you need to do is boil a small sample in water, cool it then add a few drops of iodine solution.

**ENVIRONMENTAL SANITATION:** Environmental sanitation. Activities aimed at improving or maintaining the standard of basic environmental conditions affecting the well-being of people. "Environmental sanitation" means the art and science of applying sanitary, biological and physical science principles and knowledge to improve and control the environment and factors therein for the protection of the health and welfare of the public. Inadequate sanitation, particularly in the context of urbanization, allows for sewage or waste to flow directly into streams, rivers, lakes and wetlands, affecting coastal and marine ecosystems, fouling the environment and exposing millions of children to disease. Thus, sanitation contributes to social and economic development of the society. Improved sanitation also helps the environment. Clean drinking water and good sanitation would not prevent infections without practicing good hygiene. A simple habit of washing hands goes a long way towards preventing diseases. Diarrheal diseases are the most common problem caused by poor sanitation and contaminated water. ... Developing good sanitation and hygiene can also prevent this infection. Acute respiratory infections can also be caused by poor sanitation. Improved sanitations are:

- Flush toilet.
- Connection to a piped sewer system.
- Connection to a septic system.
- Flush / pour-flush to a pit latrine.
- Pit latrine with slab.
- Ventilated improved pit latrine (abbreviated as VIP latrine)
- Composting toilet.

**EXPLOSIVE POLLUTION:** The rapid increase in numbers of a particularϖ species, especially in the world's human population since the end of World War II, attributed to an accelerating birthrate, a decrease in infant mortality, and an increase in life expectancy. A population explosion is a sudden increase in the number of individuals in a particular species. The most important cause of famine is therefore not the population explosion. Famine is primarily a consequence of unequal distribution of food, which in turn is caused by social-economic inequality, lack of democracy and (civil) war. ... Social factors are at the base of both poverty and population growth. The rapid increase of human population is putting an incredible strain on our environment. ... The demands that this growth places on our global environment are threatening the future of sustainable life on earth. One of the largest environmental effects of human population growth is the problem of global warming. Overpopulation is caused by number of factors. Reduced mortality rate, better medical facilities, depletion of precious resources are few of the causes which results in overpopulation. It is possible for a sparsely populated area to become densely populated if it is not able to sustain life. Overpopulation can result from an increase in births, a decline in mortality rates, an increase in immigration, or an unsustainable biome and depletion of resources. ... Advocates of population moderation cite issues like quality of life, carrying capacity, and risk of starvation as a basis to argue for population decline. Human overpopulation is among the most pressing environmental issues, silently aggravating the forces behind global warming, environmental pollution,

habitat loss, the sixth mass extinction, intensive farming practices and the consumption of finite natural resources, such as fresh water, arable land and fossil fuels.

**PERSONAL AND ENVIRONMENTAL HYGIENE FOR SCHOOL:** Schoolϖ dropouts are observed among female students due to a lack of latrines with facilities for menstrual hygiene. ... The provision of school hygiene and sanitation ensures the rights of students to acceptable hygiene practices, safe water supply, latrines and a healthy school environment in general. Practical control measures used to improve the basic environmental conditions affecting human health, for example clean water supply, human and animal waste disposal, protection of food from biological contamination, and housing conditions, all of which are concerned with the quality of the human environment. School hygiene and sanitation are especially important because children spend a great deal of time at school and they need a healthy environment to learn and grow, physically, mentally and socially. Sanitary inspection of public institutions is a method for identifying hygiene and sanitation problems. The mental hygiene tips for schools are-:

- Hand hygiene, such as washing your hands.
- Covering your nose and mouth when coughing or sneezing.
- Having good personal hygiene yourself.
- Making sure you provide the older adult with good personal hygiene.
- Using proper food preparation and storing food.
- Keeping dishes and utensils clean.

**OBJECTIVES OF SCHOOL HEALTH SERVICE:** The overall objective of schoolϖ health promotion is to improve student achievement by increasing healthy life skills through healthy school environment, health services, health education and health behavioral change. The school health service staff can: provide information and support to students (and their families) to help them make informed decisions about their health, wellbeing and development. To promote the maximum physical, social, emotional, and educational growth of children by providing, on school site, direct health services, health education, consultation for faculty and staff, and health promotion/prevention for staff and students.

- Early detection and care of students with health problems.
- Development of healthy attitudes and healthy behaviors by students.
- Ensure a healthy environment for children at school.
- Prevention of communicable diseases at school.
- Pediatricians and General Practitioners working in the Primary Health Care.
- Health Visitors partially or fully occupied in this service.

**ROLE OF HEALTH EDUCATION IN SCHOOLS:** Health education teaches aboutϖ physical, mental, emotional and social health. It motivates students to improve and maintain their health, prevent disease, and reduce risky behaviors. Health education curricula and instruction help students learn skills they will use to make healthy choices throughout their lifetime. The purpose of health education is to positively influence the health behavior of individuals and communities as well as the living and working conditions that influence their health. To provide emergency care for illness or injury while at school, to

ensure that all students get appropriate referrals to health care providers, to monitor for and control the spread of communicable disease, to provide education and counseling in a variety of health and wellness topics, to serve as a medical resource. Why is health and wellbeing important for learning? developing strong, supportive relationships in schools provides a safer and more inclusive environment for students to engage in their studies and learn. A student's health and wellbeing is dynamic and changeable.

**SCHOOL HEALTH SERVICES:** A comprehensive school health program is anϖ organized set of policies, procedures, and activities designed to protect and promote the health and well-being of students and staff which has traditionally included health services, healthful school environment, and health education. Components school Health Services.

Comprehensive School Health Education

- Physical Education and Activity.
- Nutrition Services.
- School Health Services.
- School Counseling, Psychological and Social Services.
- Healthy and Safe School Environments.
- Skin and eye care.
- Nail care.
- Nutritional services.
- Maintaining health record.
- Appointment of doctors to visit school weekly.
- Maintenance of First aid emergency care.

**Hygiene:** Hygiene is the process of cleaning an environment from all sickness factors which may cause health problem. Hygiene process involves all the precautions to be taken in order to reduce microorganisms. Maintaining hygiene practices reduces the spread of illness and risk of medical conditions caused by not taking care of yourself. It also increases self-confidence and positively impacts personal relationships. Keep reading for hygiene practices that help contribute to your overall health and wellness.

**Personal hygiene**: Personal hygiene is how you care for your body. This practice includes bathing, washing your hands, brushing your teeth, and more. ... Personal hygiene practices can help you and the people around you prevent illnesses. They can also help you feel good about your appearance. Follow some in instruction for keep yourself hygienic:

**Wash Your Hands Frequently:** Hand washing is one of the most effective ways to maintain personal hygiene and stop the spread of disease. You should be washing your hands frequently throughout the day and especially after tasks such as taking out the garbage, using the restroom, blowing your nose, coughing and coming into

contact with someone who may be sick. In order to benefit from washing your hands, you need to make sure you are doing it properly. Remember these five steps to washing your hands:

1. Wet your hands with clean water and apply soap.
2. Lather your hands by rubbing them thoroughly with soap.
3. Scrub your hands for at least 20 seconds.
4. Rinse your hands well.
5. Dry your hands with a towel or air dry.

**Bathe:** While older adults don't necessarily need to bathe daily, it is recommended to shower or take a bath at least twice a week. Similar to washing your hands, washing your body removes dead skin cells and dirt and is a preventative measure to reduce the risk and spread of disease.

**Wear Clean Clothes:** After wearing clothes, wash them with a detergent and dry them immediately after rinsing. Dirty clothes could harbor bacteria that leads to body odor or could even result in a skin infection.

**Brush and Floss Your Teeth Daily:** Oral hygiene is crucial to keep in mind when considering personal hygiene practices. Brush your teeth twice a day, once in the morning and once at night, and floss at least once a day. Also be sure to maintain regular dental checkups.

**Get Restful Sleep:** Getting enough sleep is essential to our overall wellbeing. It is recommended that all adults should get at least seven to nine hours of sleep each night.

**Create a Routine:** In order to maintain good personal hygiene practices, it's best to create a routine. This way, you'll make a daily list of things you need to do to stay clean and healthy and make sure you continue to practice proper personal hygiene.

**Sanitation:** Sanitation is the creation of a clean and hygienic environment and making it sustainable.

**Benefits of improving sanitation**

Benefits of improved sanitation extend well beyond reducing the risk of diarrhea. These include:

- reducing the spread of intestinal worms, schistosomiasis and trachoma, which are neglected tropical diseases that cause suffering for millions;
- reducing the severity and impact of malnutrition;
- promoting dignity and boosting safety, particularly among women and girls;
- promoting school attendance: girls' school attendance is particularly boosted by the provision of separate sanitary facilities; and
- Potential recovery of water, renewable energy and nutrients from faecal waste.

**First aid:** First aid refers to the immediate treatment of an individual(s) that is injured or ill. First aid is not a full medical treatment, but something that can be done to stabilize a person so they can be moved to a hospital for regular medical treatment, or to preserve life while waiting for medical professionals. First aid is a certification that is required for many professions, and is available from a wide variety of institutions.

The office can seem like a safe place to work, but, there are risks you wouldn't think of until they happen. An accident can occur at any time and if it did, who in the workplace is trained to help? It is a legal requirement as a company to ensure your employees receive immediate attention. Here are Some reasons why you should consider First Aid Training for employees.

**1. It can save lives:** This may seem like the most obvious reason, but it is proved that first aid saves lives. If there is an accident in the office is anyone trained to come to the rescue? First aid training gives your staff the confidence and ability to react immediately to an incident, injury or illness. CPR (Cardiopulmonary Resuscitation) has been reported that many lives have been saved due to fast reaction CPR. This would have been given during critical and life-threatening accidents, injuries or health complications in the workplace.

**2. Reduce the number of workplace accidents:** First aid training helps employees learn to be more conscious of safety in the workplace, leading to a reduced number of accidents and injuries. Minimizing risk to workers and decreasing workplace incidents is a benefit to everyone, but for employers it has implications within all aspects of business operations. All employees become more safety aware, helping to bring down the number of accidents.

**3. Positive work environment:** By making first aid training available to employees, employers can show their workforce that they care about providing a safe work environment. First aid training provided in the workplace can even be used as an excellent team-building exercise and morale booster. Employee morale is an integral part of any company. High morale leads to positive attitudes and positive attitudes lead to positive results. The happiness and wellbeing of your employees will help you build a strong relationship, ultimately resulting in a better working environment. First aid training will help ensure employee health and safety in addition to enhanced wellbeing and morale.

**4. Your company will be safer place to work:** Many large companies give first aid as part of employee training; this is a very wise option because it guarantees they can all look out for one another. If an accident happens at work; employees may be able to prevent further injury to the victim of the accident. First aid courses in the work place promote safer practise amongst employees.

**5. First aid kits are used properly:** Not only will your employees know exactly what should be in the first aid kit and be able to maintain it properly, they'll be able to use them effectively in an emergency. They will know where to access it quickly – again saving time and reducing the impact of the illness or injury. First aid trainees know exactly what's in their first aid kits, how to use the contents, and the various ways to react in an emergency. In a beneficial way, it makes each employee an unofficial health and safety risk manager.

**6. It can reduce recovery time:** Rapid reaction to illness or injury, before further aid such as an ambulance arrives can not only save lives, but in addition, will reduce recovery time of the patient. If that patient is a member of staff, that means they'll be back to work quicker, with less impact on the business.

**CONCLUSION:** Health problems are increasingly defined not by what kills us but by what ails us. In 1990, childhood underweight was the leading risk factor for ill health, but high body mass index surpassed it in 2010 as a more important cause of premature death and disability. Educational programs for professionals in public health, medicine, nursing, health administration, public management, and related fields should include CHIP concepts and practices in their curriculum for pre service and midcareer students. The Public Health Service, in conjunction with state and local health agencies, national professional organizations, and foundations, should develop workbooks, seminars, and other forms of technical assistance to catalog and convey to communities information on best CHIP practices, specific model performance measures for a variety of health issues and ways to interpret changes in these measures, and available data resources.

# Unit – 3

# Environmental Science (Part-A)

## Introduction

For the last four decades, several environmental problems—such as pollution, global warming, ozone layer depletion, acid rain, deforestation, and desertification—have remained a major focus of scientists, policy makers, and common public across the world. These problems are perceived as the major threats to the life-supporting environment of the earth, thus making our survival on the planet increasingly unsafe. In order to tackle these challenges, holistic knowledge about working of our life-supporting environment and thorough understanding of the dynamics of these problems become imperative. Since no other academic discipline covers the above two knowledge requirements completely, environmental science evolved as an academic discipline to fill in this gap. Our life-supporting environment and various environmental problems are highly complex and require interdisciplinary efforts to understand them. Environmental science, therefore, integrates approaches of various academic disciplines to fulfill its objectives.

Environmental science is defined as an interdisciplinary academic field that integrates various academic fields (particularly sciences) to study the structure and function of our life-supporting environment and to understand causes, effects, and solutions of different environmental problems. In other words, environmental science is the scientific study of all the components or factors that make or influence our life-supporting biophysical environment. As per some academicians, environmental science is a methodological study of the environment and includes the study of all biophysical as well as anthropogenic conditions or circumstances under which an organism lives.

## History of Environmental science

Environmental science came into existence as a substantive and active field of scientific investigation after the 1960s. Rachael Carson's landmark environmental book Silent Spring played a crucial role in the process by raising concern about environmental issues for the first time. Events such as Santa Barbara oil spill and the Cuyahoga River of Cleveland, Ohio, "catching fire" in 1969 further helped increase the visibility of environmental issues.

Since the 1970s, environmental issues have been addressed chiefly in terms of implications of development process on environmental quality. The book Limit to Growth by Club of Rome (1970) and Stockholm Conference (1972) drew the attention of the world community towards environmental imbalance caused by the prevailing patterns of development. In 1987, Brundtland Commission, in its report "Our Common Future", introduced the word Sustainable Development, which emphasized the need for a development process that takes care of the nature and the welfare of future generations. The Agenda 21 adopted during the Earth Summit at Rio de Janeiro (1992) and the World Summit on Sustainable

Development at Johannesburg (2002) also contributed significantly to increase awareness about the need for making the development process eco-friendly.

An increasing level of concern about environment was reflected in the creation of a number of international environmental agencies and non-governmental organizations (NGOs), including United Nations Environmental Program (UNEP), International Union for Conservation of Nature and Natural Resources (IUCN), World Wide Fund for Nature (WWF), and Global Environmental Facility (GEF). Similarly, numerous scientific and policy-related forums and conventions were held for settling environmental issues, including Ramsar Convention for conservation of wetland fauna and flora, Montreal Protocol for protecting the ozone layer, Intergovernmental Panel on Climate Change (IPCC) for quantifying the extent of global warming, Kyoto Protocol for reducing emission of greenhouse gases, and Convention on Biological Diversity (CBD) for preserving the rich biodiversity of the planet. These developments in the field of environment were accompanied by substantial enhancement in our scientific and overall understanding about the environment, which in turn led to the creation of a new academic discipline known as environmental science.

The evolution of the subject was driven by:

(i) The need for a multidisciplinary approach to analyze complex environmental problems
(ii) The arrival of substantive environmental laws requiring specific environmental protocols of investigation
(iii) The growing public awareness of a need for action in addressing environmental problems. Since the 1970s, this subject has been promoted worldwide and gradually included in the formal education systems of different countries. For the subject to have widespread reach and adoptability among common man, it is often catered by the name Environmental Sciences.

## Meaning of Environment studies

The word ‘environment’ is derived from the old French word ‘environer’ – which means to ‘surround, enclose, and encircle’. Environment refers to an aggregate of conditions or surroundings in which living beings such as humans, animals, and plants live or survive and non-living things exist.

All living beings including man and their environment are mutually reactive, affecting each other in a number of ways. It is generally equated with nature wherein physical components of the planet earth such as earth, air, water, etc. support and affect life in the biosphere. Environment represents the physical components of the earth, wherein man is an important factor affecting the environment.

Environment comprises interacting systems of physical, biological, and cultural elements, which are interlinked individually as well as collectively in various ways.

Environment studies are all about learning the way we should live and how we can develop sustainable strategies to protect the environment. It helps individuals to develop an understanding of living and physical environment and how to resolve challenging environmental issues affecting nature. In addition to studying the physical aspects of the environment, it also emphasizes the need to conserve biodiversity and adopt a more sustainable lifestyle and utilize resources in a responsible way. To create awareness among today's generation on pressing environmental problems, the University Grants Commission (UGC) has made it mandatory for the universities to introduce a course in environmental studies and teach students about the eco-system, pollution and problems concerned with the environment. Let us discuss the dire need to include environmental studies in the course curriculum.

**Learn how to use resources sustainably:**

With natural resources such as air, water, oil, minerals are getting depleted rapidly, the environmental studies course can help students understand the importance of these resources and how we can improve the situation by taking appropriate actions in our regular lives to preserve these resources.

**Create awareness about preserving the environment:**

Whether it is spreading awareness against plastic use or air pollution, universities can conduct various beyond-the-classroom activities as a part of this course to make students understand the significance of protecting the environment. Activities such as conducting awareness programs and rallies can prevent the degradation of the environment.

**Participate in the mass movement to protect nature:**

While pursuing a course in environmental studies, students can be a part of mass public awareness movements and encourage their fellow batch mates to participate. Whether it is taking an initiative by planting trees in the campus, conducting workshops on various pressing issues or joining an NGO that supports environmental conservation, students can learn about various ways of protecting and conserving the environment.

## Scope of Environmental study:

Principles and approaches of environmental sciences are applicable in several areas of development. These areas are studied as scope of the subject. Environmental science has a vast scope since it covers a wide range of subject matters or issues related to our complex life-supporting system. Scope of the subject can be described in terms of major areas of applicability as well as career opportunities related to the subject. Three major areas of applicability of the subject are:

(i) Management of natural resources,
(ii) Conservation of ecosystem and biodiversity
(iii) Prevention and control of pollution.

In addition, environmental science plays a key role in solving complex environmental issues of varying scale, including climate change, ozone layer depletion, energy crisis,

desertification, urbanization, population explosion, and so on. Scope of the subject in terms of career opportunities is fairly vast. For the last two decades, environmental science has been considered to be associated with a number of career opportunities. Major career options related to the subject can be described as follows:

• **Industries:** Industries need to show compliance against a number of environmental norms. Hence, environment experts are needed to guide the industries for adopting clean technologies, controlling pollution, disposing the wastes, and carrying out environmental audit.

• **Consultancy:** Environment consultancies are hired by governments, industries, and NGOs for carrying out different types of laboratory based analyses or field-based studies, which are often, required in environment impact assessment (EIA) and other compliance processes.

• **Research and development (R&D):** R&D opportunities in this area include studying different types of pollution and their causes and effects. It also includes development of clean and efficient technologies for future. Scientists, researchers, and analysts are some of the common career profiles.

• **Academics:** Environmental science is taught at almost every level of education, that is, from school to university level. A large number of teachers or academicians are required to fulfill this need.

• **Green marketing:** Skilled manpower is required to promote eco friendly products in market. Environmental quality certifications like ISO-14000 are also being incorporated in marketing strategy—this creates additional career opportunities.

• **Green media:** In order to generate awareness about the environment, there is an immense need for skilled manpower in the field of print and electronic media. A number of magazines and newspapers regularly publish articles on environmental theme, for example, Down to Earth, a magazine published by Centre for Science and Environment.

• **Green advocacy:** Environmental lawyers are emerging as major players in ensuring proper implementation of environmental norms, laws, and programs. Public Interest Litigation (PIL) empowers a common man to fight against any anti-environment activity.

• **NGOs:** These days, most of the environmental programs are being implemented through NGOs, with the help of funds from national and international agencies. Green-peace, CI, WWF, CSE, CEE, TERI, Tarun Bharat Sangh, and Vatavaran are some examples of environmental NGOs.

• **Government jobs:** A number of conventional jobs are available in government bodies such as environmental ministry, pollution control boards, national parks, and biosphere reserves.

• **International agencies:** Various international agencies such as UNEP, IUCN, TSBF, and World Bank require qualified human resources to implement environment-related projects.

## Needs for Environmental Studies

Nature or environment sustains life. As a conscious and rational being, man needs to know the importance of environment and help keep the environment as healthy and productive as it can be. It is the environment that has made this beautiful world possible for him. Hence, there is an ever demanding need for environmental studies.

The natural environment that mankind had before the onset of industrialization, urbanization, and exponential growth in population was expectedly healthy and resilient. Nature was able to replenish the loss of its resources, which was very limited.

After the onset of modern civilization, the overall health and efficiency of natural environment started deteriorating gradually and went on to such an extent that nature has virtually lost its natural ability to replenish the loss of resources caused by man.

Environmentalists, geographers, and biologists the world over are constantly endeavoring for a sustainable solution to restore a sustainable environment.

There is a need for focus on environmental management, laws governing environment protection, pollution and recycling of non-bio-degradable material, etc. There is also a need for careful and cautious use of natural resources in the present time to establish sustainability in every aspect of nature.

There is a need to clarify modern environmental concepts such as how to conserve biodiversity and maintain an ecological balance.

Environmental study helps us to understand the importance of our environment and teaches us to use natural resources more efficiently and embrace a sustainable way of living. It enables us to know the behavior of organisms under natural conditions and the interrelationship between organisms in population and communities.

The interaction and interrelationship between the living community (plants, animals, and organisms) in relation to each other and the non-living community (soil, air, and water) is referred to as an ecosystem. Thus, an ecosystem is a structural and functional unit of biosphere. It is made up of living and non-living beings and their physical environment.

## Importance of Environmental study:

Today, the world is facing numerous environmental problems, ranging from local problems such as ground water depletion to global problems such as climate change. These problems can be solved only when everyone cares for the environment; for that everyone needs to be informed about the causes, consequences, and remedial measures of different environmental problems. In order to achieve this goal, environmental science is promoted and taught at different educational levels. The subject bears immense importance as it aims at saving the integrity of the life supporting environment of earth, which is a unique planet that sustains life. Importance of this subject can be described in terms of the various objectives that it fulfils for saving the environment. So far, seven such objectives have been identified:

- It guides us to know how our developmental and day-to-day activities affect environment and how we are affected by changes in the environmental conditions.
- It guides us to create a pollution-free environment (that is, clean air, water, land, and food) by adopting different methods of preventing and controlling pollution.
- It guides us to utilize our natural resources such as water, forest, minerals, and fossil fuels in an efficient manner, that is, with maximum utility and minimum wastage, by adopting conservation and recycling strategies.

• It guides common public to live an eco-friendly lifestyle by adopting the above three features, that is, knowing environmental implications of one's activities, preventing and controlling pollution, and utilizing the resources efficiently in day-to-day activities.

• It guides industries to operate in an eco-friendly mode by adopting clean and efficient technologies and installing pollution control systems.

• It guides us to solve complex global environmental problems such as climate change, ozone-layer depletion, desertification, and energy crisis by using different interdisciplinary tools and approaches. It guides the entire development process to become sustainable by ensuring equal distribution of natural resources between present and future generations, as well as by caring for nature in every walk of life in a holistic manner.

## Types of Environment:

Environment, which means surroundings, is the sum of all external factors (biotic and abiotic) that influence the life of an organism. Biotic factors include all living beings (for example, humans, animals, plants, and microorganisms), whereas abiotic factors include all physico-chemical entities (such as air, water, soil, rocks, minerals, and mountains). Environment can be natural, human engineered, or even abstract (nonmaterial). Owing to such vagueness, the term "environment" has been used in various ways or in various perspectives. For example, terms such as natural environment, extra-terrestrial environment, human engineered environment, socio-political-cultural environment, business environment, family environment, and workplace environment are used in general conversation.

Although using the word "environment" in all these contexts is not wrong, due to a variety of meanings of the same word, people often get confused about the basic concept of the subject "environmental sciences". As a result, often some questions are raised: What is the definition of environment in the domain of environmental sciences? What exactly do we study under the subject "environmental sciences"? If environment means surroundings, then environmental science should mean scientific study of everything that surrounds us. This implies that environmental science is the study of not only air and water but also every insect, every chemical, and every human-made article, such as computer, building, furniture, as well as every relations at home, office, and so on. Thus, environmental science is a sum of all sciences, all engineering subjects, all social sciences, and so on. This cannot be true, as a single subject cannot replace all others; therefore, the concept of environment needs to be understood more precisely. For the purpose of conceptual clarification, different uses of the word environment have been classified into the following two broad groups:

**1. Essential life-supporting biophysical environment:** It includes all the biophysical entities as well as the processes that contribute to providing all humans and other living beings the basic material needs of life, that is, oxygen, water, food, and habitat. In fact, the concepts of environmental sciences are based on this meaning. The "essential life-supporting biophysical environment" is also termed as "environment", "natural environment", "biophysical environment", "biosphere", or "ecological system". These words are used almost synonymously.

**2. Non-essential life-assisting environment:** It includes all the entities or processes that assist human life in various ways, but cannot be considered essential for the physical survival of life on this planet. It includes social systems, language, technology, economic

system, education, and various aspects of human civilization. Although we can survive physically, without these entities the life will be largely in wild or natural form. “Non-essential life-assisting environment” is also known as “anthropogenic environment”, “social environment”, “man-made environment”, or “built environment”.

### Environmental Education:

Environmental Education is a process in which individuals gain awareness of their environment and acquire knowledge, skills, values, experiences, and also the determination, which will enable them to act - individually and collectively - to solve present and future environmental problems. Environmental Education is a complex process, covering not just events, but a strong underlying approach to society building as a whole. Environmental Education provides people with the awareness needed to build partnerships, understand NGO activities, develop participatory approaches to urban planning, and ensure future markets for eco-business.

Environmental education is a learning process that increases people’s knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (UNESCO, Tbilisi Declaration, 1978). Environmental education enhances critical thinking, problem-solving, and effective decision-making skills, and teaches individuals to weigh various sides of an environmental issue to make informed and responsible decisions. Environmental education does not advocate a particular viewpoint or course of action.

The components of environmental education are:

1. Awareness and sensitivity to the environment and environmental challenges
2. Knowledge and understanding of the environment and environmental challenges
3. Attitudes of concern for the environment and motivation to improve or maintain environmental quality
4. Skills to identify and help resolve environmental challenges
5. Participation in activities that lead to the resolution of environmental challenges

## Concept of Environmental Education:

Unlike traditional forms of education, Environmental Education is a holistic, lifelong learning process directed at creating responsible individuals who explore and identify environmental issues, engage in problem solving, and take action effectively to improve the environment. As a result, individuals develop a deeper awareness and understanding of environmental issues and have effective skills to make informed and responsible decisions that lead to resolute the environmental challenges.

Environmental Education is neither environmental advocacy nor environmental information; rather, Environmental Education is a varied and diverse field that focuses on the educational process that has to remain neutral by teaching individuals critical thinking and enhancing their own problem-solving and decision-making skills in a participatory approach. The guiding

principles of Environmental Education include awareness, knowledge, attitudes, skills and participation.

## Basics of Environmental Education

Environmental Education can be taught formally in schools, classrooms, colleges and universities, or it can take place in informal learning contexts through NGOs, businesses, and the media, natural centers, botanic gardens, bird-watching canoeing, scuba diving and ecotourism. Besides, Environmental Education takes place in various non-formal education programs such as experiential outdoor education, workshops, outreach programs and community education.

Environmental educator should deliver Environmental Education in a unique way as it is not only based on science, but also concerned with historical, political, and cultural aspects with the human dimension of socio-economic factors. It is also based on developing knowledge on socio-ecological systems. Environmental Education provides opportunities to children to build skills to become environmentally-smart, including problem-solving and investigation skills. Qualified environmental educators should work in the field, conducting programs, involving and collaborating with local communities, and using strategies to link the environmental awareness, building skills, and responsible action. It is through Environmental Education that citizens, especially children, can test various aspects of an issue to make informed, science-based, non-biased, and responsible decisions.

## History of Environmental Education

The roots of environmental education can be traced back as early as the 18th century when Jean-Jacques Rousseau stressed the importance of an education that focuses on the environment in Emile: or, On Education. Several decades later, Louis Agassiz, a Swiss-born naturalist, echoed Rousseau's philosophy as he encouraged students to "Study nature, not books." These two influential scholars helped lay the foundation for a concrete environmental education program, known as Nature study, which took place in the late 19th century and early 20th century.

The nature study movement used fables and moral lessons to help students develop an appreciation of nature and embrace the natural world. Anna Botsford Comstock, the head of the Department of Nature Study at Cornell University, was a prominent figure in the nature study movement and wrote the Handbook for Nature Study in 1911, which used nature to educate children on cultural values. Comstock and the other leaders of the movement, such as Liberty Hyde Bailey, helped Nature Study garner tremendous amounts of support from community leaders, teachers, and scientists and change the science curriculum for children across the United States.

A new type of environmental education, Conservation Education, emerged as a result of the Great Depression and Dust Bowl during the 1920s and 1930s. Conservation Education dealt with the natural world in a drastically different way from Nature Study because it focused on rigorous scientific training rather than natural history. Conservation Education was a major

scientific management and planning tool that helped solve social, economic, and environmental problems during this time period.

The modern environmental education movement, which gained significant momentum in the late 1960s and early 1970s, stems from Nature Study and Conservation Education. During this time period, many events – such as Civil Rights, the Vietnam War, and the Cold War – placed Americans at odds with one another and the U.S. government. However, as more people began to fear the fallout from radiation, the chemical pesticides mentioned in Rachel Carson's Silent Spring, and the significant amounts of air pollution and waste, the public's concern for their health and the health of their natural environment led to a unifying phenomenon known as environmentalism.

The first article about environmental education as a new movement appeared in Phi Delta Kappan in 1969, authored by James A. Swan. A definition of "Environmental Education" first appeared in Educational Digest in March 1970, authored by William Stapp. Stapp later went on to become the first Director of Environmental Education for UNESCO, and then the Global Rivers International Network.

Ultimately, the first Earth Day on April 22, 1970 – a national teach-in about environmental problems – paved the way for the modern environmental education movement. Later that same year, President Nixon passed the National Environmental Education Act, which was intended to incorporate environmental education into K-12 schools. Then, in 1971, the National Association for Environmental Education (now known as the North American Association for Environmental Education) was created to improve environmental literacy by providing resources to teachers and promoting environmental education programs.

Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, in 1972, declared environmental education must be used as a tool to address global environmental problems. The United Nations Education Scientific and Cultural Organization (UNESCO) and United Nations Environment Program (UNEP) created three major declarations that have guided the course of environmental education.

## Celebration various days in relation with Environment

| | |
|---|---|
| 2nd February - | World Wetlands Day |
| 3rd March - | World Wildlife Day |
| 14th March - | International Day of Action for Rivers |
| 21st March - | International Day of Forests |
| 22nd March - | World Water Day |
| 23rd March - | World Meteorological Day |
| 7th April - | World Health Day |
| 10th April - | World Atmosphere Day |
| 22nd April - | International Mother Earth Day |
| 29th April - | Day of Remembrance for all Victims of Chemical Warfare |
| 9th May - | World Migratory Bird Day |
| 17th May - | Endangered Species Day |
| 22nd May - | International Day for Biological Diversity |
| 31st May - | No Tobacco Day |
| 5th June - | World Environment Day |
| 8th June - | World Oceans Day |

17th June - World Day to Combat Desertification and Drought
26th July - International Day for the Conservation of the Mangrove Ecosystem
28th July - World Nature Conservation Day
29th July - International Tiger Day
9th August - The International Day of the World's Indigenous Peoples
16th September - International Day for the Preservation of the Ozone Layer
28th September - Green Consumer Day
4th October - World Animal Day
5th October - World Habitat Day
11th November - World Migratory Bird Day
5th December - World Soil Day
11th December - International Mountain Day
14th December - National Energy Conservation Day

# Recycling (Part-B)

Our world is changing rabidly due to the rapid economic development, and the resulted significant increase in the amount of produced wastes. As a result; the environmental benefits of recycling have become a major component of waste management programs. Thus, there was a need for new teaching methodology and materials in the educational sector that allows the crucial implementation of the recycling concept in the creation of all the new designs and products. Then students can learn how to create new designs from recycled materials since it became essential and a must. As a result, this paper argues that it is applicable to make recycled products more attractive to the future generation, regarding the recovering and reusing waste products—from household use, and thereby reducing their burden on the environment.

Recycling is the process of converting waste materials into new materials and objects. The recovery of energy from waste materials is often included in this concept. The recyclability of a material depends on its ability to reacquire the properties it had in its virgin or original state

## Benefits of Recycling

- Reduces the amount of waste sent to landfills and incinerators
- Conserves natural resources such as timber, water and minerals
- Increases economic security by tapping a domestic source of materials
- Prevents pollution by reducing the need to collect new raw materials
- Saves energy
- Supports American manufacturing and conserves valuable resources
- Helps create jobs in the recycling and manufacturing industries in the United States

## Steps to Recycling Materials

Recycling includes the three steps below, which create a continuous loop, represented by the familiar recycling symbol.

## Step 1: Collection and Processing

There are several methods for collecting recyclables, including curbside collection, drop-off centers, and deposit or refund programs.

After collection, recyclables are sent to a recovery facility to be sorted, cleaned and processed into materials that can be used in manufacturing. Recyclables are bought and sold just like raw materials would be, and prices go up and down depending on supply and demand in the United States and the world.

## Step 2: Manufacturing

More and more of today's products are being manufactured with recycled content. Common household items that contain recycled materials include the following:

- Newspapers and paper towels
- Aluminum, plastic, and glass soft drink containers
- Steel cans
- Plastic laundry detergent bottles

Recycled materials are also used in new ways such as recovered glass in asphalt to pave roads or recovered plastic in carpeting and park benches.

## Step 3: Purchasing New Products Made from Recycled Materials

You help close the recycling loop by buying new products made from recycled materials. There are thousands of products that contain recycled content. When you go shopping, look for the following:

- Products that can be easily recycled
- Products that contain recycled content

## Plastics Recycling:

Plastic production has been rapidly increasing since the 1950s. Every 15 years the quantity of plastic being produced has doubled. This is the fastest increase of any man-made material ever. We can see this increase in our daily lives, with plastic being used pretty much everywhere and for everything. Plastic can be found in so many places in our modern world: in our homes, in our automobiles, at our jobs, in our electronics, in our children's toys, in our gardens… Plastic even surrounds most of our food!

All of this plastic use is quite significant for the environment, since the majority of plastics available today are derived from petroleum, a non-renewable resource. Globally, we have started to realize that we have a problem, but plastic is so entrenched into our lives it cannot be easily removed.

One good way to stem the production of plastic is to recycle plastic that has already been produced and use it to make new products. Plastic recycling has become more advanced in recent years and is always becoming more efficient. Fortunately, a lot of plastic can be remade into new products. Plastic waste recycling reduces our need for more fossil fuels, saves energy, landfill space, and emissions of carbon dioxide and other greenhouse gases.

## Plastic recycling process

Plastic recycling is broken up into a few distinct steps. Generally these steps remain the same for most types of recycling facilities, but certain steps can be combined or omitted in some situations.

## Step 1: Collection

The first step in the recycling process is always collecting the plastic material that is to be recycled.

This step is completely reliant upon businesses, restaurants, and the public to dispose of their plastic waste in the correct place. If plastic waste is disposed of in normal trash bins, it will *not* be recycled, so it is extremely important to separate common waste and plastic waste.

Additionally, it is ideal for governments to have a recycling collection system that goes to people's houses or businesses to collect the plastic waste. If this is not possible, local collection points for plastic should be easy for the public to access. Making it easy and convenient for people to correctly dispose of plastic waste is paramount in promoting recycling.

## Step 2: Sorting

After plastics are collected and transported to a recycling facility, the next step is sorting.

Machines sort plastics into different areas based upon a multitude of properties that are often dependent upon the recycling facility or what final product is being produced.

Plastics are usually sorted in a few common ways, such as the type of plastic (material it is made with), color of the plastic, or even how it was made. This is important because different types of plastics must be processed in different ways and some recycling facilities are only capable of recycling one type of plastic. If the wrong type of plastic is processed at the incorrect facility it can reduce the efficiency of the whole process and require the entire batch to be sent back again for resorting.

## Step 3: Washing

Just like with clothes, fruits/vegetables, and many other things, plastics must be washed before they are further processed. The goal of this step is to remove impurities and everything that is not made from plastic.

Most containers and packages have labels, adhesive, or even food residue that must be removed. This non-plastic waste *cannot* be recycled and can cause the final product to have poor structural integrity.

### Step 4: Resizing

Resizing consists of shredding or granulating the plastic waste into small particles. This increases the surface area of the plastic, making it easier to process, reshape, and transport if needed.

Additionally, it gives recycling facilities one last opportunity to remove any non-plastic waste that has made it through the first 3 steps of processing. This is often done with metal detectors or magnets that will help remove any leftover metal in the mixture.

### Step 5: Identification and separation of plastics

The identification and separation of plastics is when the now small plastic particles are tested to determine their quality and class.

The first quality tested is density. This is done by floating the particles in a large tank of water. Particles less dense than water will float and more dense particles will sink.

Next their air classification is determined. Air classification is an official term for how thick or thin a particle is. This is done by dropping the particles into a small wind tunnel. The smaller pieces will fly higher up the tunnel and bigger ones will remain lower.

Two other features plastics are commonly tested for are their melting point and color. These are determined by collecting and analyzing samples from each batch of plastic particles.

### Step 6: Compounding

The final step in the recycling process is often considered the most exciting because it is when the plastic particles are made into recycled materials usable for future production. Compounding is when the small particles are smashed and melted together into plastic pellets. The pellets can then be used in the production of other plastic productss.

Throughout this process the plastic may be moved to different plants that specialize in different steps of the process. It can be energy intensive and the better educated we are about the process the more we can reduce the time and energy it requires.

### Example: Recycling of a plastic bottle

Let's say that you have just finished drinking water from a commercial disposable (but recyclable!) water bottle. As you place your empty water bottle into your home recycling bin as you always do, you wonder, *"What will actually happen to this water bottle after I'm finished with it?"*

In order for your plastic water bottle to get from your recycling bin and made into new products, it goes on a long journey!

- First, your bottle must be collected by a recycling facility. This can happen when recycling collection drivers pick up your plastic recycling bin on your curb in front of your house, or when you bring your recyclable waste to a local recycling facility.
- Next, if your local recycling company has implemented a Single Stream Recycling System, by which all materials are collected together, these materials must undergo a sorting process to separate different materials, such as glass, paper, or metals. Most often, the majority of this sorting process is done automatically by machines, but it may also include one manual sort to eliminate as much contamination of the materials as possible.
- Since there are numerous types of plastics in use today, all of the plastic materials in a recycling facility must be separated by type. Your plastic water bottle will likely be grouped with the other plastic materials made with #1 polyethylene terephthalate (PET or PETE) plastic. Unfortunately, certain types of plastics are not as easily recycled as other types of plastics. Many recycling facilities do not have equipment that can handle every type of plastic, and so these items may be sold to another facility that can recycle them or they may end up in a landfill. Ask your plastic recycling company about what they do with items they cannot process.
- Next, your plastic water bottle will go to an area of the recycling facility where it will be ground up into chips or flakes, and the plastic will then be washed to get rid of any labels or remaining residue.
- The plastic is dried, melted, and formed into pellets, which can be used for manufacturing new products.
- Recycled plastic pellets can then be sold to companies and used to make different products. Some products made from recycled plastic bottles include artificial fleece, engineered wood products, carpeting, floor mats, tiles, furniture, motor oil, detergent bottles, pipes and pails.

Your water bottle will now be given a new life as something else! Plastic bottle recycling is then definitely worth your effort.

## Role of School in Environmental Conservation:

The main goal of environmental education is to empower citizens so they can bring about change within their societies. With the help of creativity and co-operation, learning can be more effective towards ensuring that all species are in equilibrium with their environment.

Schools can also promote economic sustainability by encouraging loaning, sharing, and re-using items, as well as favoring recyclable products. Additionally,

Involving schoolchildren in environment friendly activities will help them grow into aware citizens of the planet who can also make a difference to their communities.

*"If the bee disappeared off the surface of the globe, then man would have only four years of life left. No more bees, no more pollination, no more plants, no more animals, no more man."*

**Albert Einstein**

Nature is beautiful and needs to be preserved. Nature, when taken care of, provides us with everything we need but it can also express its fury if abused. Lately we have been witness to the fury - with the forest fires, drought, excessive rainfall and its attendant problems. Excessive pollution and exploitation of resources is also causing immense environmental damage.
An important thing is: Though we cannot reverse the effect of our actions, we can work towards restoring the damage done, looping in the best people. In this effort we have to also include the younger generation that will inherit the planet.
'Environment preservation' should be integrated with core subjects right from preschool. When we reinforce the importance of environment preservation in children from a young age, they will be conscious of the decisions they make. They will also correct their elders when they see them doing things that are harmful for the environment. What we need is a conscious set of youngsters to take on this mantle and drive it through.

**1. Environmental clubs** – Your school can form an environmental club or become a part of an existing one in the vicinity and conduct activities around environment preservation. These could include setting up a recycling system in the school cafeteria, planting a small organic garden that will provide fresh vegetables for the cafeteria. Children can also support local wildlife and reduce CO2 in the atmosphere by planting trees, shrubs and flowers in the school playground.

**2. Cleanliness drives** – Schools can have cleanliness drives on campus where children make sure that everything is kept clean and litter free. From classes to school playgrounds - they should be made to feel responsible for keeping all areas spotlessly clean. They should also be encouraged to participate in cleanliness drives in their communities.

**3. Embedding environmental preservation in the curriculum** – Schools can also make sure children start learning about environment preservation from an early age. If children are being taught about water as an EVS (environmental studies) topic then teachers can cover local water bodies like lakes and rivers. They can apprise the children about water scarcity and ask them to creatively think of ways to conserve water by water harvesting, innovative means to keep water bodies clean and so on.

**4. Environment friendly policies** – Schools should make sure they have environmental policies that they follow in school and students should be educated on the same. They can install solar panels so children can actually see and experience environment friendly practices daily.

**5. Environment preservation posters created digitally** – schools have adequate space where display screens can be placed to run digital posters, artwork, etc. to make it a part of their subconscious learning. One corner can be dedicated to environmental preservation where students, teachers and parents can contribute to the same with digital posters, drawings, poems, latest articles, etc.

**6. Adopt a plant program:** Schools can have a program to adopt one plant in school and one at home and take pledge to provide complete care to it with the help of a gardener or parents and others.

**7. Teach children to have empathy for living creatures** – Empathy is an important value that schools need to inculcate in children. They need to understand that all living creatures need to be looked after. This can be imparted through stories and role play where children become animals, plants or insects. Ask them how they would feel if their homes and habitats are destroyed.

**8. Have special days dedicated to the environment** – Organize special events like a ‘kids walk to school day’ or ‘create no trash day” involving parents too.

## Unit – 4
## Natural Resources (Part-A)

These are the resources that are found in the environment and are developed without the intervention of humans. Common examples of natural resources include air, sunlight, water, soil, stone, plants, animals and fossil fuels.

Natural resources are naturally occurring materials that are useful to man or could be useful under conceivable technological, economic or social circumstances or supplies drawn from the earth, supplies such as food, building and clothing materials, fertilizers, metals, water and geothermal power. For a long time, natural resources were the domain of the natural sciences.

**Based on the availability are two types of natural resources**:

1. **Renewable:** resources that are available in infinite quantity and can be used repeatedly are called renewable resources. Example: Forest, wind, water, etc.
2. **Non-Renewable:** resources that are limited in abundance due to their non-renewable nature and whose availability may run out in the future are called non-renewable resources. Examples include fossil fuels, minerals, etc.

**Difference between Renewable and Non-Renewable Resources**

| Renewable resource | Non-renewable resource |
|---|---|
| 1. It can be renewed as it is available in infinite quantity | Once completely consumed, it cannot be renewed due to limited stock |
| 2. Sustainable in nature | Exhaustible in nature |
| 3. Low cost and environment-friendly | High cost and less environment-friendly |
| 4. Replenish quickly | Replenish slowly or do not replenish naturally at all |

**The 5 Most Important Natural Resources are:**

1. **Air:** Clean air is important for all the plants, animals, humans to survive on this planet. So, it is necessary to take measures to reduce air pollution.
2. **Water:** 70% of the Earth is covered in water and only 2 % of that is fresh water. Initiative to educate and regulate the use of water should be taken.
3. **Soil:** Soil is composed of various particles and nutrients. It helps plants grow.
4. **Iron:** It is made from silica and is used to build strong weapons, transportation and buildings

5. **Forests:** As the population increases, the demand for housing and construction projects also increases. Forests provide clean air and preserve the ecology of the world.

## Water Resources:

Water resources are sources of water that are useful or potentially useful to humans. It is important because it is needed for life to exist. Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually all of these human uses require fresh water.

Our main sources of water for drinking, washing, agriculture and industry are surface water, groundwater and collected rainwater, all of which are dependent on rain and snow falling on the Earth's surface.

Around 71 percent of the earth's surface is covered in water. This massive quantity of water is hard to visualize: the total water resources of the earth equal roughly 326 million cubic miles, with each cubic mile equal to around *1 trillion gallons* of water. To imagine just one trillion gallons of water, try to picture 40 million swimming pools, or 24 billion baths. Now, multiply those numbers by 326 million!

Of all of this water, only about 2.5 percent is freshwater: the other 97.5 percent is saltwater. Almost 69 percent of freshwater resources are tied up in glaciers and ice caps, about 30 percent, is groundwater, and a mere 0.27 percent is surface water. While all kinds of water resources are important for the survival of the planet, accessible freshwater is especially important for humans.

## Uses of water

1) For drinking

2) For cleaning dishes

3) For cooking

4) For watering plants

5) For washing clothes

6) For bathing

7) For generation of hydroelectricity

8) For washing car

9) Making our dog bath

10) It helps in maintaining osmotic rate in humans

**Saltwater Resources**

As mentioned, saltwater is abundant in the surface of the planet. However, saltwater is currently not particularly useful when it comes to potable water supplies. Desalination plants, while they do exist, are scarce because the energy required for desalination makes the process extremely expensive.

That said, there are saltwater resources from which humans benefit, aside from beautiful ocean views. Saltwater fish are a staple in much of the world's diet (although overfishing and pollution has put much of the marine life population at risk). Furthermore, tidal waters are being used as a source of hydroelectric energy. So, while saltwater is not helpful in dealing with scarce water supplies, it does provide resources that humans rely on.

**Groundwater Resources**

Groundwater is the most plentiful of all freshwater resources. As water percolates into the ground through layers of soil, clay, and rock, some of it adheres to the topmost layers to provide water to plants. This water is in what is called the unsaturated, or *vadose*, zone. Most of the pores in the vadose zone are filled with air, rather than water.

Gravity continues to move the water down through the ground. Eventually, the water reaches the saturated zone, where all the pores are filled with water. The separation between the saturated and unsaturated zone is called the water table.

Aquifers are areas of permeable rock that hold water. Typically, aquifers are made of bedrock that has many fractures and connected pores, such as limestone, sandstone and gravel. Shale and clay layers are impermeable, and therefore make poor aquifers. An aquifer is "recharged" through precipitation from above percolating through the layers of soil and rock. Therefore, there is significant interaction between surface water and ground water.

In turn, groundwater feeds surface water through springs, and surface water can also recharge groundwater supply.

Most often, groundwater is accessed by humans via wells. To build a well, one must drill down past the water table. In most cases, a pump is placed in the bottom of the well, and it is pumped into homes, businesses and water treatment plants, where it is then dispersed. As water is pumped from the ground, a cone of depression forms around the well. The groundwater from the surrounding area moves towards the well. Wells can run dry during times of drought, or if surrounding wells are pumping too much water, causing the cone of depression to be large.

Water pumped from wells is generally very clean. The layers of soil, clay and rock acts as a natural filter. However, contaminants from nearby contaminated soils, leaky underground tanks, and septic systems can pollute a well, rendering it unusable. Furthermore, salt water intrusion can occur when the rate of pumping near a shoreline exceeds the rate of recharge. Saltwater gets pulled from the ocean into the cone of depression, and enters the well.

Subsidence, the gradual settling of the land due to continuous pumping and development, has also become an issue as groundwater is mined. This occurs when groundwater is pumped out

faster than it can be replenished, and the sediment beneath becomes compacted. Subsidence is a permanent phenomenon. It can cause structural problems to foundations, an increased incidence of sinkholes and flooding problems. To top it off, subsidence is extremely costly. In some areas, such as the San Joaquin Valley in California, the land has subsided over 30 feet due to groundwater withdraw.

**Surface Water Resources**

Surface water is the water that exists in streams and lakes. This water is primarily used for potable water supply, recreation, irrigation, industry, livestock, transportation and hydroelectric energy. Over 63 percent of the public water supply is withdrawn from surface water. Irrigation gets 58 percent of its water supply from surface water. Industry gets almost 98 percent of its water from surface water systems. Therefore, surface water conservation and quality is of the utmost importance.

Watershed organizations continuously measure the stream flow and quality of surface water. Stream flow is monitored to warn of flooding and drought conditions. Water quality is very important, as the majority of the water used in the United States comes from surface water. It is the measure of how suitable the water is from a biological, chemical and physical perspective. Water quality can be impacted negatively by both natural and human causes: electrical conductivity, pH, temperature, phosphorus levels, dissolved oxygen levels, nitrogen levels and bacteria are tested as a measure of water quality.

Water that runs off into the stream can naturally carry sediment, debris and pathogens. Turbidity, the measure of suspended sediment in a stream, is also a measure of water quality. The more turbid the water, the lower the water quality.

Manmade contaminants such as gasoline, solvents, pesticides, and nitrogen from livestock can wash over the land and can leach in to waterways, degrading the quality of nearby waters. The Clean Water Act in the United States protects the quality of the stream and issues fines to those contributing to the degradation in water quality. By protecting and conserving the water supply, there is a greater guarantee of future water resources for human use.

## Food Resources

We know that all living organisms need food. Food supplies proteins, carbohydrates, fats, vitamins and minerals, all of which we require for body development, growth and health. Both plants and animals are major sources of food for us. We obtain most of this food from agriculture and animal husbandry.

India is a very populous country. Our population is more than one billion people, and it is still growing. As food for this growing population, we will soon need more than a quarter of a billion tons of grain every year. This can be done by farming on more land. But India is already intensively cultivated. As a result, we do not have any major scope

for increasing the area of land under cultivation. Therefore, it is necessary to increase our production efficiency for both crops and livestock.

Efforts to meet the food demand by increasing food production have led to some successes so far. We have had the green revolution, which contributed to increased food-grain production. We have also had the white revolution, which has led to better and more efficient use as well as availability of milk.

However, these revolutions mean that our natural resources are getting used more intensively. As a result, there are more chances of causing damage to our natural resources to the point of destroying their balance completely. Therefore, it is important that we should increase food production without degrading our environment and disturbing the balances maintaining it.

Hence, there is a need for sustainable practices in agriculture and animal husbandry.

Also, simply increasing grain production for storage in warehouses cannot solve the problem of malnutrition and hunger. People should have money to purchase food. Food security depends on both availability of food and access to it. The majority of our population depends on agriculture for their livelihood. Increasing the incomes of people working in agriculture is therefore necessary to combat the problem of hunger. Scientific management practices should be undertaken to obtain high yields from farms. For sustained livelihood, one should undertake mixed farming, intercropping, and integrated farming practices, for example, combine agriculture with livestock/poultry/fisheries/ bee-keeping.

**Main Food Resources**

Human beings need air, water and food to survive but out of these, food is an important material for the growth and functioning of body. Main food resources are:

Crops: Mainly crops providing grains like rice, wheat, maize, etc.

Vegetables and fruits: It includes vegetables and different types of fruits.

Animals and Birds: Animals like cow, goat, pig, camel and hen are utilized for food production.

Aquatic animals: This includes different types of fishes, ducks, crane and water birds.

•Average Minimum dietary requirement about 1800 cal/person per day

•Increasing population results in less per capita food availability

•Relation between population growth and growth in food production becomes important

•Food production in most developing countries is less than their population growth rates

•About 700 million dependent on agriculture in India

•From 1951 to 1997: gross irrigated area (GIA) (includes double cropping) expanded four fold, from 23 M Ha to 90 M Ha

•India has the largest irrigated area among all the countries in the world among all the countries in the world

**Healthy Diet**

• Consuming a healthy diet throughout the life-course helps to prevent malnutrition in all its forms as well as a range of non communicable diseases (NCDs) and conditions. However, increased production of processed foods, rapid urbanization and changing lifestyles have led to a shift in dietary patterns.

**A healthy diet includes the following:**

• Fruit, vegetables, legumes (e.g. lentils and beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat and brown rice).
• Person of healthy body weight consuming about 2000 calories per day
• At least 400 g of fruit and vegetables per day
• Less than 10% of total energy intake from free sugars
• Less than 30% of total energy intake from fats
•Unsaturated fats (found in fish, avocado and nuts, and in sunflower, soybean, canola and olive oils) are preferable to saturated fats (found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard)
•It is suggested that the intake of saturated fats be reduced to less than 10% of total energy intake and trans-fats to less than 1% of total energy intake.
• Less than 5 g of salt (equivalent to about one teaspoon) per day. Salt should be iodized.

**Unsustainable Agriculture**

•Modern agricultural pattern pollutes environment with excessive use of pesticide and fertilizer
•Monoculture (single crop) enhances the risk of production

•Reducing/ stagnating crop yields: fatigue of intensive agriculture and climate change
•Incremental use of inorganic fertilizer and pesticide
•impacts of climate change and global warming on agriculture

**Overexploitation of Resource**

•Reducing availability of natural resources for agriculture
•Need for increased resources: land, water, fertilizers, capital
• Soils are being exploited faster than they can recuperate
• Excessive conversion of forests, grasslands and wetlands to agricultural land
• Fish resource, both marine and inland, show evidence of exhaustion

**Malnutrition**

•Around the world, there are two types of food problems are found: 1. Malnutrition, 2. Undernourishment
•Malnutrition result from the absence of minimum amount of proteins, carbohydrates, lipids, vitamins and other essential nutrients required for proper health and growth. It may cause productivity losses, nutrition related illnesses and problems of health and growth especially in children. These problems are common in poor countries and include problems caused by the deficiency of nutrients like iodine, iron and vitamins.

## Forest Resources

A forest is a natural, self-sustaining community characterized by vertical structure created by presence of trees. Trees are large, generally single-stemmed, woody plants. Forest can exist in many different regions under a wide range of conditions, but all true forests share these physical characteristics.

Because a forest is a natural community, no forest is static in time. That is, because forest communities respond to outside influences, most forests are in a state of constant flux. Depending upon the systems within which forest communities exist, such factors might include rainfall, fire, wind, glaciations, seismic activity, flooding, animal activity, insulation, and so on.

At any time, a forest is a collection of past responses to outside influences and internal competitive interactions. Therefore, the present status of any forest, indeed of any natural community, reflects what has gone on before.

**The direct benefits from forests are:**

**(a) Fuel Wood:**

Wood is used as a source of energy for cooking purpose and for keeping warm.

**(b) Timber:**
Wood is used for making furniture, tool-handles, railway sleepers, matches, ploughs, bridges, boats etc.

**(c) Bamboos:**
These are used for matting, flooring, baskets, ropes, rafts, cots etc.

**(d) Food:**
Fruits, leaves, roots and tubers of plants and meat of forest animals form the food of forest tribes.

**(e) Shelter:**
Mosses, ferns, insects, birds, reptiles, mammals and micro-organisms are provided shelter by forests.

**(f) Paper:**
Wood and Bamboo pulp are used for manufacturing paper (Newsprint, stationery, packing paper, sanitary paper)

**(g) Rayon:**
Bamboo and wood are used in the manufacture of rayon (yarns, artificial silk-fibres)

**(h) Forest Products:**
Tannins, gums, drugs, spices, insecticides, waxes, honey, horns, musk, ivory, hides etc. are all provided by the flora and fauna of forests.

**The indirect benefits from forests are:**

**(a) Conservation of Soil:**
Forests prevent soil erosion by binding the soil with the network of roots of the different plants and reduce the velocity of wind and rain — which are the chief agents causing erosion.

**(b) Soil-improvement:**
The fertility of the soil increases due to the humus which is formed by the decay of forest litter.

**(c) Reduction of Atmospheric Pollution:**
By using up carbon dioxide and giving off oxygen during the process of photosynthesis, forests reduce pollution and purify the environment.

**(d) Control of Climate:**
Transpiration of plants increases the atmospheric humidity which affects rainfall and cools the atmosphere.

**(e) Control of Water flow:**
In the forests, the thick layer of humus acts like a big sponge and soaks rain water preventing run-off, thereby preventing flash-floods. Humus prevents quick evaporation of water, thereby ensuring a perennial supply of water to streams, springs and wells.

**Deforestation:**
Deforestation is the permanent destruction of indigenous forests and woodlands. The term does not include the removal of industrial forests such as plantations of gums or pines. Deforestation has resulted in the reduction of indigenous forests to four-fifths of their pre-agricultural area.

Indigenous forests now cover 21% of the earth's land surface. The World Resources Institute regards deforestation as one of the world's most pressing land-use problems. The difference between forests and woodlands is that whereas in a forest the crowns of individual trees touch to form a single canopy, in woodland, trees STOW far apart, so that the canopy is open.

Of great concern is the rate at which deforestation is occurring. Currently, 12 million hectares of forests are cleared annually. Almost all of this deforestation occurs in the moist forests and open woodlands of the tropics.

At this rate all moist tropical forest could be lost by the year 2050, except for isolated areas in -Amazonia, the Zaire basin, as well as a few protected areas within reserves and parks. Some countries such as Ivory Coast, Nigeria, Costa Rica, and Sri Lanka are likely to lose all their tropical forests by the year 2010 if no conservation steps are taken.

## Causes of Deforestation:

**(1) Population Explosion:** Population explosion poses a grave threat to the environment. Vast areas of forest land are cleared of trees to reclaim land for human settlements (factories, agriculture, housing, roads, railway tracks etc.) growth of population increases the demand for forest products like timber, firewood, paper and other valuable products of industrial importance, all necessitating felling of trees.

**(2) Forest Fires: Fires in the forests may be due to natural calamities or human activities:**

(a) Smoldering of the humus and organic matter forming a thick cover over the forest floor (i.e. ground fires).

(b) Dried twigs and leaves may catch fire (i.e. surface fires).

(c) In densely populated forests, tree tops may catch fire by heat produced by constant rubbing against each other (i.e. crown fires).

(d) Human activities like clearing forest for habitation, agriculture, firewood, construction of roads, railway tracks and carelessness (throwing burning cigarette stubs on dried foliage).

Fire destroys fully grown trees, results in killing and scorching of the seeds, humus, ground flora and animal life.

**(3) Grazing Animals:** Trampling of the forest soil in the course of overgrazing by livestock has four reaching effects such as loss of porosity of soil, soil erosion and desertification of the previously fertile forest area.

**(4) Pest Attack:** Forest pests like insects etc. destroy trees by eating up the leaves, boring into shoots and by spreading diseases.

**(5) Natural Forces:** Floods, storms, snow, lightening etc. are the natural forces which damage forests.

## Effects of Deforestation:

Forests are closely related with climatic change, biological diversity, wild animals, crops, medicinal plants etc.

(a) Habitat destruction of wild animals (tree-using animals are deprived of food and shelter.)

(b) Increased soil erosion due to reduction of vegetation cover.

(c) Reduction in the oxygen liberated by plants through photosynthesis.

(d) Increase in pollution due to burning of wood and due to reduction in Car- bon-dioxide fixation by plants.

(e) Decrease in availability of forest products.

(f) Loss of cultural diversity

(g) Loss of Biodiversity

(h) Scarcity of fuel wood and deterioration in economy and quality of life of people residing near forests.

(i) Lowering of the water table due to more run-off and thereby increased use of the underground water increases the frequency of droughts.

(j) Rise in Carbon dioxide level has resulted in increased thermal level of earth which in turn results in melting of ice caps and glaciers and consequent flooding of coastal areas.

# Energy

Energy is the capacity to do work and is required for life processes. An energy resource is something that can produce heat, power life, move objects, or produce electricity. Matter that stores energy is called a fuel. Human energy consumption has grown steadily .throughout human history. Early humans had modest energy requirements, mostly food and fuel for fires to cook and keep warm. In today's society, humans consume as much as 110 times as much energy per person as early humans. Most of the energy we use today come from fossil fuels (stored solar energy). But fossils fuels have a disadvantage in that they are non-renewable on a human time scale, and cause other potentially harmful effects on the environment. In any event, the exploitation of all energy sources (with the possible exception of direct solar energy used for heating), ultimately rely on materials on planet Earth.

## Types of Sources of Energy

These can be broken down into renewable and non-renewable energy sources.

## Renewable Energy Source

A renewable energy source is any natural resource that can replace it quickly and dependably. These energy sources are plentiful, sustainable, naturally replenished and good to the environment.

The major types or sources of renewable energy are:

- Solar energy from the sun
- Wind energy
- Geothermal energy from the heat inside the earth
- Hydropower from flowing water
- Ocean energy in the form of wave, tidal, current energy and ocean thermal energy.
- Biomass from plants

## Non-renewable Energy Source

A non-renewable energy source is a source with a limited supply that we can mine or extract from the earth, and it’ll eventually run out.

These are formed over thousands of years from the buried remains of ancient sea plants and animals that lived millions of years ago. Most of these energy sources are “dirty” fossil fuels, which are generally bad for the environment.

The major types or sources of non-renewable energy are:

- Petroleum
- Hydrocarbon gas liquids
- Natural gas
- Coal
- Nuclear energy

**Different Sources of Energy**

Here is an overview of each of the different sources of energy that are in use and what’s the potential issue for each of them.

**1. Solar Energy**

The primary source of energy is the sun. Solar power harvests the energy of the sun by using collector panels to create conditions that can then be turned into a kind of power. Large solar panel fields are often used in the desert to gather enough power to charge small substations, and many homes use solar systems to provide for hot water, cooling and supplement their electricity.

Its availability is also dependent on the change in seasons and weather when they may not always be used. It requires high initial investments for productive use as solar electricity storage technology has not reached its optimum potential yet.

**2. Wind Energy**

Wind power is becoming more and more common. The new innovations that are allowing wind farms to appear are making them a more common sight. By using large turbines to take available wind as the power to turn, the turbine can then turn a generator to produce electricity.

It requires high investment, and wind speed is also not uniform every time, which affects the generation of power.

**3. Geothermal Energy**

Geothermal energy is the energy that is produced from beneath the earth. It is clean, sustainable and environmentally friendly. High temperatures are produced

continuously inside the earth's crust by the slow delay of radioactive particles. Hot rocks present below the earth heats up the water that produces steam. The steam is then captured, which helps to move turbines. The rotating turbines then power the generators.

Geothermal energy can be used by a residential unit or on a large scale by an industrial application. It was used during ancient times for bathing and space heating. Geothermal plants typically have low emissions if they pump the steam and water they use back into

**4. Hydrogen Energy**

Hydrogen is available with water (H2O) and is the most common element available on earth. Water contains two-thirds of hydrogen and can be found in combination with other elements.

Once it is separated, it can be used as a fuel for generating electricity. Hydrogen is a tremendous source of energy and can be used as a source of fuel to power ships, vehicles, homes, industries and rockets. It is completely renewable, can be produced on demand and does not leave any toxic emissions in the atmosphere.

**5. Tidal Energy**

Tidal energy uses the rise and fall of tides to convert the kinetic energy of incoming and outgoing tides into electrical energy. The generation of energy through tidal power is most prevalent in coastal areas. Tidal energy is one of the renewable sources of energy and produces large energy even when the tides are at low speed.

When there is an increased height of water levels in the ocean, tides are produced, which rush back and forth in the ocean. In order to capture sufficient power from the tidal energy potential, the altitude of high tide needs to be at least five meters (around 16 feet) greater than low tide.

**6. Wave Energy**

Wave Energy is produced from the waves that are produced in the oceans. As the ocean is ruled by the moon's gravity, it makes harnessing its power an attractive option. Different techniques for transforming wave energy to electric power have been studied with dam-like structures or ocean floor–anchored devices on or just below the water's surface.

Wave energy is renewable, environment friendly and causes no harm to the atmosphere. It can be harnessed along coastal regions of many countries and can help a country to reduce its dependence on foreign countries for fuel.

## 7. Hydroelectric Energy

What many people are not aware of is that most of the cities and towns in the world rely on hydropower, and have for the past century. Every time you see a major dam, it is providing hydropower to an electrical station somewhere. The power of the water is used to turn generators to produce the electricity that is then used. It is non-polluting, entails no waste or produces toxic gases, and environment friendly.

## 8. Biomass Energy

Biomass Energy is produced from organic material and is commonly used throughout the world. Chlorophyll present in plants captures the sun's energy by converting carbon dioxide from the air and water from the ground into carbohydrates through the process of photosynthesis. When the plants are burned, the water and carbon dioxide are again released back into the atmosphere.

Biomass generally includes crops, plants, trees, yard clippings, wood chips and animal wastes. Biomass energy is used for heating and cooking in homes and as a fuel in industrial production.

## 9. Nuclear Power

The energy is created through a specific nuclear reaction, which is then collected and used to power generators. While almost every country has nuclear generators, there are moratoriums on their use or construction as scientists try to resolve safety and disposal issues for waste.

Nuclear energy is produced from uranium, a non-renewable energy source whose atoms are split (through a process called nuclear fission) to create heat and, eventually, electricity. Scientists think uranium was created billions of years ago when stars formed. Uranium is found throughout the earth's crust, but most of it is too difficult or too expensive to mine and process into fuel for nuclear power plants.

## 10. Fossil Fuels (Coal, Oil and Natural Gas)

When most people talk about the different sources of energy, they list natural gas, coal and oil as the options – these are all considered to be just one source of energy from fossil fuels. Fossil fuels provide power for most of the world, primarily using coal and oil.

Oil is converted into many products, the most used of which is gasoline. Natural gas is starting to become more common but is used mostly for heating applications, although there are more and more natural gas-powered vehicles appearing on the streets.

## Conservation

Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity the survival of many species and habitats which are threatened due to human activities can be ensured. Other reasons for conserving biodiversity include securing valuable Natural Resources for future generations and protecting the well being of eco-system functions.

Conservation can broadly be divided into two types:

**In-situ:** Conservation of habitats, species and ecosystems where they naturally occur. This is in-situ conservation and the natural processes and interaction are conserved as well as the elements of biodiversity.

**Ex-situ:** The conservation of elements of biodiversity out of the context of their natural habitats is referred to as ex-situ conservation. Zoos, botanical gardens and seed banks are all example of ex-situ conservation.

In-situ conservation is not always possible as habitats may have been degraded and there may be competition for land which means species need to be removed from the area to save them.

## Wildlife

Wildlife consists of flora and fauna, i.e. plants, animals and microorganisms which are not domesticated by humans. On the other hand Conservation is preserving and protecting Wild plants, animals and their habitats. Therefore, we can say that the Conservation of Wildlife is necessary to recognize the importance of nature and other wildlife species.

## Wildlife Conservation

We are already aware of the fact that a number of flora and fauna species have become extinct over the years. Although losing a number of species is a normal part of evolution, humans are losing more and more animal species at an alarmingly rapid pace.

There are plenty of reasons why many of them are led to extinction. A few would be overpopulation, deforestation, consumer culture, climate change, animal exploitation, and the list goes on. As experts argue, humans are now facing the sixth great extinction.

Conservation of Wildlife is important to protect the endangered plants and animal species along with their natural habitat. The main concern is to preserve the habitats so that the future generations of wildlife and even humans can enjoy it.

Wildlife Conservation is the practice of protecting plant and animal species and their habitats. As part of the world's ecosystems, wildlife provides balance and stability to nature's processes. The goal of wildlife conservation is to ensure the survival of these species, and to educate people on living sustainably with other species.

The human population has grown exponentially over the past 200 years, to more than seven billion people today, and it continues to rapidly grow. This means natural resources are being consumed faster than ever by the billions of people on the planet. This growth and development also endangers the habitats and existence of various types of wildlife around the world, particularly animals and plants that may be displaced for land development, or used for food or other human purposes. Other threats to wildlife include the introduction of invasive species from other parts of the world, climate change, pollution, hunting, fishing, and poaching.

**Definition**

Wildlife conservation is an activity in which humans make conscious efforts to protect plants and other animal species and their habitats. Wildlife conservation is very important because wildlife and wilderness play an important role in maintaining the ecological balance and contribute to human quality of life.

**Steps to be taken for the Conservation of Wildlife are:**

1**.** Some of the laws should be made to ban the killing or capturing of endangered animals or birds. It should be made a punishable offense. Such laws should be enforced strictly and should not remain on paper only.
2. Indiscriminate killing of wild birds and animals, whether are in abundance should not

be allowed by the forest authorities.
3. The more number of National Parks and Sanctuaries should be established for preserving the natural habitats of wild animals and birds throughout the country.
4. The Department of Government should conduct a periodic survey in all the forests regarding the conservation of wildlife. They should have the knowledge about the population of all the species of wild animals and birds, so that they can be helped during the time of floods and famines.
5. Special attention should be paid even by us also to the conservation of endangered species of wild animals and birds to prevent their extinction altogether.

## Species Extinction

Extinction occurs when species are diminished because of environmental forces (habitat fragmentation, global change, natural disaster, overexploitation of species for human use) or because of evolutionary changes in their members (genetic inbreeding, poor reproduction, decline in population numbers).

Animal extinctions may be caused by natural occurrences such as climatic heating or cooling or changes in sea levels. In more modern times, however, human activity has been to blame. Habitat destruction as farming land expands and forests are cut-down is the main cause of modern extinctions, along with pollution, the introduction of alien species, and over fishing or hunting. Increasingly, however, climate change is thought to be driving extinctions.

**List of Some Extinct Animals**

**West African Black Rhinoceros**

The West African Black Rhinoceros was found in several countries towards the southeast region of Africa. Measuring 3 to3.8 meters long and 1.4 to1.7 meters in height, this rhino would have weighed 800 to1. 300 kg. It had two horns, one measuring 0.5 to1.3 meters and the other between 2 to 2. 55 cm. Their diet included leafy plants and shoots. Some believe their horns had medicinal properties – though this had no grounding in scientific fact- which leads to heavy poaching. In the 1930’s preservation action was taken to protect the species, but the numbers continued to decline. The last West African Black Rhino was seen in Cameroon in 2006. It was declared officially extinct in 2011.

**Baiji White Dolphin**

Baiji White Dolphin, also called the Chinese River Dolphin, can only be found in the Yangtze River in China. These mammals could grow to eight feet long and weigh up to a quarter of a ton. They relied on echolocation to navigate and hunt for pray due to their tiny eyes and very poor eyesight. Living in the Yangtze for 20 million years, their numbers declined drastically from the 1950s onwards. As China industrialized, the river was used for fishing, transportation and hydroelectricity which had a huge effect on the mammals. Although not officially recorded as extinct, no one has seen a Yangtze River Dolphin since 2002.

**Spanish Ibex or Iberian Goat**

One of four subspecies of the Spanish Ibex or Iberian Goat, that was found in the Iberian Peninsula. The Ibex would grow to a height of 60-76cm at the shoulder and weighs 24-80 kg and fed mainly on grasses and herbs. They were thought to have numbered 50,000 historically, but by the early 1900s its numbers had fallen to fewer than 100. The exact cause of the Pyrenean Ibex's extinction is unknown; scientists believe factors included poaching and the inability to compete with other mammals for food and habitat. The last Pyrenean Ibex was killed by a falling tree in northern Spain in 2000.

**Passenger Pigeon**

Native to North America, the Passenger or Wild Pigeon has been extinct since the early 20th century. It is estimated that between 3 and 5 billion Passenger Pigeons inhabited the US when Europeans arrived in North America, but their settlement led to mass deforestation resulting in habitat loss and a reduction in the bird population. By the 19th century pigeon meat was commercialized as a cheap food for the poor, which resulted in hunting on a massive scale. The Passenger Pigeon died out in the wild by around 1900, with the last known individual dying in captivity in 1914.

**Tasmanian Tiger**

Native to Australia, Tasmania and New Guinea, the Tasmanian Tiger was a large carnivorous marsupial. Not related to tigers, the creature had the appearance of a medium-to-large-size dog (it weighed 30kg with a nose to tail length of almost 2 meters) but dark stripes gave it a tiger-like appearance. It is believed to have been hunted to extinction – this was encouraged by bounties – but human encroachment into its habitat, the introduction of dogs and disease could also have contributed. The last wild Tasmanian tiger was killed between 1910 and 1920, with the last captive one dying in Hobart Zoo, Tasmania in 1936.

**How to Save Wildlife**

**Learn about endangered species in your area:** Teach your friends and family about the wonderful wildlife, birds, fish and plants that live near you. The first step to protecting endangered species is learning about how interesting and important they are. Our natural world provides us with many indispensable services including clean air and

water, food and medicinal sources, commercial, aesthetic and recreational benefits. For more information about endangered species, visit endangered.

**Make your home wildlife friendly:** Secure garbage in shelters or cans with locking lids, feed pets indoors and lock pet doors at night to avoid attracting wild animals into your home. Reduce your use of water in your home and garden so that animals that live in or near water can have a better chance of survival. Disinfect bird baths often to avoid disease transmission. Place decals on windows to deter bird collisions. Millions of birds die every year because of collisions with windows. You can help reduce the number of collisions simply by placing decals on the windows in your home and office. For more information on what you can do, check out these tips from the US Fish and Wildlife Service.

**Slow down when driving:** Many animals live in developed areas and this means they must navigate a landscape full of human hazards. One of the biggest obstacles to wildlife living in developed areas is roads. Roads divide habitat and present a constant hazard to any animal attempting to cross from one side to the other. So when you're out and about, slow down and keep an eye out for wildlife.

**Recycle and buy sustainable products:** Buy recycled paper, sustainable products like bamboo and Forest Stewardship Council wood products to protect forest species. Never buy furniture made from wood from rainforests. Recycle your cell phones, because a mineral used in cell phones and other electronics is mined in gorilla habitat. Minimize your use of palm oil because forests where tigers live are being cut down to plant palm plantations.

**Harassing wildlife is cruel and illegal.** Shooting, trapping, or forcing a threatened or endangered animal into captivity is also illegal and can lead to their extinction. Don't participate in this activity, and report it as soon as you see it to your local state or federal wildlife enforcement office.

**Protect wildlife habitat.** Perhaps the greatest threat that faces many species is the widespread destruction of habitat. Scientists tell us the best way to protect endangered species is to protect the special places where they live. Wildlife must have places to find food, shelter and raise their young. Logging, oil and gas drilling, over-grazing and development all result habitat destruction. Endangered species habitat should be protected and these impacts minimized.

**SOIL POLLUTION— CAUSES, TYPES, EFFECT AND CONTROL MEASURES SOIL:**

Soil, the uppermost layer of the earth's crust is a mixture of many solid, liquid and gaseous substances having both living and non living matter such as mineral particles, decaying organic matter, microbes along with water and air contained in pore spaces. Formation of soil is a very slow process starting from weathering (Breakdown of bed rock into mineral particles) to soil development i.e. pedogenesis (modification of mineral matter through interactions between biological, topographic and climatic factors). It may take 200 to some thousand years to form an inch of top soil depending upon the local conditions of the area. Thus soil is an important natural resource, formed over the centuries that supports the variety of plants and provides habitat for various microscopic and macroscopic life-forms apart from other ecological functions.

Composition of soil is listed below:

| Components in Soil | Percentage |
|---|---|
| Organic mineral matter | 45% |
| Organic matter | 05% |
| Soil water | 25% |
| Soil air | 25% |

## SOIL POLLUTION

Soil pollution is the contamination of the soil with pollutants, toxic chemicals or any contaminant in such a quantity that reduces soil quality and makes it inhabitable to organisms such as insects and other microbes. Or it can be referred to as the addition of chemicals to the soil in quantities that are toxic to the environment and its residents. This addition is mostly by human activities such as mining, modern practices in agriculture, deforestation, indiscriminate dumping of human generated trash and unregulated disposal of untreated wastes of various industries.

### Causes of Soil Pollution

**1. Industrial and Mining Activities:** Large numbers of Industries coming up since the dawn of industrial era without proper waste management systems are the biggest contributor to soil pollution. Also since the amount of mining and manufacturing has increased and most industries are dependent on extracting minerals from the Earth. Whether it is iron ore or coal, the by products are contaminated and they are not disposed off in a manner that can be considered safe. As a result, the industrial waste dumped on the soil surface for a long period of time degrades it.

**2. Modern Agricultural Practices:** To increase the yield from limited land area, in order to meet the increasing demand of food for ever increasing population, synthetic chemical pesticides and fertilizers are being used rampantly in last few decades leading to toxicity of the soil. They seep into the ground after they mix with water and slowly reduce the fertility of the soil. Other chemicals damage the composition of the soil and make it easier to erode by water and air. Plants absorb many of these pesticides and when they decompose, they cause soil pollution since they become a part of the land.

**3. Lack of proper Waste Disposal:** Modern lifestyle, urban as well as rural, produces huge amount of waste and lack of waste management procedures adds to the problem of soil pollution. Urban wastes comprise of both commercial and domestic wastes consisting of dried sludge and sewage, garbage and rubbish materials like plastics, glasses, metallic cans, fibres, paper, rubbers, street sweepings, fuel residues, leaves, containers, abandoned vehicles and other discarded manufactured products. Plastic and other non biodegradable wastes are the major cause of concern.

**4. Radioactive Pollutants:** Radioactive substances resulting from explosions of nuclear testing laboratories, radioactive fallout and industries giving rise to nuclear dust and radioactive wastes penetrate the soil and accumulate giving rise to soil pollution. E.g. Nuclear reactors produce waste containing Ruthenium-106, Iodine-131, Barium-140, Cesium-144 and Lanthanum-140 along with primary nuclides Sr-90 with a half life 28 years and Cs-137 with a half life 30 years. Rain water carries Sr-90 and Cs-137 to be deposited on the soil where they are held firmly with the soil particles by electrostatic forces. All the radio nuclides deposited on the soil emit gamma radiations.

**5. Biological Agents**: Soil gets a large amount of human, animal and bird excreta which constitute a major source of land pollution by biological agents. E.g. Heavy application of manures and digested sludge can cause serious damage to plants within a few years

**6. Accidental Oil Spills:** Oil leaks can happen during storage and transport of chemicals. This can be seen at most of the fuel stations. The chemical present in the fuel deteriorates the quality of soil and make them unsuitable for cultivation. These chemicals can enter into the groundwater through soil and make the water undrinkable.

**7. Acid Rain:** Acid rain is caused when pollutants present in the air mixes up with the rain and fall back on the ground. The polluted water could dissolve away some of the important nutrients found in soil and change the structure of the soil.

## Effects of Soil Pollution

Impacts of soil pollution are not confined to soil and its biota but are carried over to every aspect of the environment and affect every organism from the earthworm to humans. Some of the adverse effects are as follows:

### Human health

Since we are dependent on the land for our food, pollution from the soil is transferred to us in this manner. Bio accumulation of toxins occurs in our bodies, causing chronic poisoning, and leading to various diseases. Reproductive health, birth and developmental defects, neurologic effects, malnutrition, and mutations in the cells of the body leading to cancers; all these are on the increase today.

### Growth of plants

Plants will not be able to adapt to sudden changes occurring in the soil. Fungi and bacteria found in the soils cannot bind the soil due to chemical changes and this causes soil erosion. Large tracts of land become barren; unable to support any life on it. Even the plants that do grow on these lands will absorb the toxins and transfer to the food chain.

### Air pollution

Toxic dust rises from landfills along with foul odour, pollutes the air and causes adverse effects to the people who live near them.

**1. Effect on Human Health:** Considering how soil is the reason we are able to sustain ourselves, the contamination of it has major consequences on our health. Crops and plants grown on polluted soil absorb much of the pollution and then pass these on to us. This could explain the sudden surge in small and terminal illnesses. Long term exposure to such soil can affect the genetic make-up of the body, causing congenital illnesses and chronic health problems that cannot be cured easily. In fact, it can sicken the livestock to a considerable extent and cause food poisoning over a long period of time. The soil pollution can even lead to widespread famines if the plants are unable to grow in it.

**2. Effect on Growth of Plants:** The ecological balance of any system gets affected due to the widespread contamination of the soil. Most plants are unable to adapt when the chemistry of the soil changes so radically in a short period of time. Fungi and bacteria found in the soil that bind it together begin to decline, which creates an additional problem of soil erosion. The fertility slowly diminishes, making land unsuitable for agriculture and any local vegetation to survive. The soil pollution causes large tracts of land to become hazardous to health. Unlike deserts, which are suitable for its native vegetation, such land cannot support most forms of life.

**3. Decreased Soil Fertility:** The toxic chemicals present in the soil can decrease soil fertility and therefore decrease in the soil yield. The contaminated soil is then used to produce fruits and vegetables which lacks quality nutrients and may contain some poisonous substance to cause serious health problems in people consuming them.

**4. Effect on landscape:** Huge piles of refuse and garbage being open dumped and littered over an area spoils the serenity of the landscape. The emission of toxic and foul gases from landfills pollutes the environment and causes serious effects on health of some people. The unpleasant smell causes inconvenience to other people.

**5. Changes in Soil Structure:** The death of many soil organisms (e.g. earthworms, insects and microbes) in the soil can lead to alteration in soil structure. Apart from that, it could also force their predators to move to other places in search of food.

**6. Effect on Ecosystem:** Soil pollution can lead to the lack of biodiversity in an ecosystem. The life of bird, insect, mammal and reptile species that live in the soil can get affected by pollution. The soil is an important habitat.

## Control of soil pollution

The following steps have been suggested to control soil pollution. To help prevent soil erosion, we can limit construction in sensitive area. In general we would need less fertilizer and fewer pesticides if we could all adopt the three R's: Reduce, Reuse, and Recycle. This would give us less solid waste.

### Reducing chemical fertilizer and pesticide use:

Applying bio-fertilizers and manures can reduce chemical fertilizer and pesticide use. Biological methods of pest control can also reduce the use of pesticides and thereby minimize soil pollution.

**Reusing of materials:** Materials such as glass containers, plastic bags, paper, cloth etc. can be reused at domestic levels rather than being disposed, reducing solid waste pollution.

**Recycling and recovery of materials:** This is a reasonable solution for reducing soil pollution. Materials such as paper, some kinds of plastics and glass can and are being recycled. This decreases the volume of refuse and helps in the conservation of natural resources. For example, recovery of one tone of paper can save 17 trees.

**Reforesting:** Control of land loss and soil erosion can be attempted through restoring forest and grass cover to check wastelands, soil erosion and floods. Crop rotation or mixed cropping can improve the fertility of the land.

**Solid waste treatment:**

Proper methods should be adopted for management of solid waste disposal. Industrial wastes can be treated physically, chemically and biologically until they are less hazardous. Acidic and alkaline wastes should be first neutralized; the insoluble material if biodegradable should be allowed to degrade under controlled conditions before being disposed.

## Noise Pollution

The word noise is derived from a Latin word ‘Nausea’ which means sickness in which one feels the need to vomit. Noise is the unpleasant and undesirable sound which leads to discomfort in human beings. **The intensity of sound is measured in decibels (dB)**. The faintest sound which can be heard by the Human ear is 1 Db. Due to increasing noise around the civilizations; noise pollution has become a matter of concern. Some of its major causes are vehicles, aircraft, industrial machines, loudspeakers, crackers, etc. Some other appliances also contribute to noise pollution like television, transistor, radio, etc. when used at high volume.

### Noise Pollution Examples:

Following are the examples of noise pollution:

- Unnecessary usage of horns
- Using loudspeakers either for religious functions or for political purposes
- Unnecessary usage of fireworks
- Industrial noise
- Construction noise
- Noise from transportation such as railway and aircraft

### Types of Noise Pollution

### Man-Made Noise

This refers to the noise created due to man-made activities. It can be anything from construction work, noise from the air, vehicular traffic, household noise, noise from pubs and bars, to name a few. Ranging from 30 to a whopping 140 dB, this form of noise is extremely harmful to humans.

**Environmental Noise**

Environmental Noise refers to the kind of noise occurring from a range of environmental activities. This can be anything from the mating call of animals to the sound of thunderstorms that often go up to 140 dB.

**Various Causes of Noise Pollution**

**1. Industrialization**

Most of the industries use big machines which are capable of producing a large amount of noise. Apart from that,various equipment like compressors, generators, exhaust fans, grinding mills also participates in producing big noise. You're probably familiar with the sight of workers in these factories and industries wearing earplugs to minimize the effect of noise.

However, even after taking precautionary measures like these, extensive exposure to high levels of noise might damage their hearing abilities in the long run.

**2. Poor Urban Planning**

In most of the developing countries, poor urban planning also plays a vital role. Congested houses, large families sharing small space, fight over parking, frequent fights over basic amenities lead to noise pollution, which may disrupt the environment of society.

Noise pollution in urban settings may also be caused when residential properties and industrial buildings are in proximity. In situations like these, the noise from the nearby industrial property might hinder the basic well-being of the individuals living in residential properties.

**3. Social Events**

Noise is at its peak in most of the social events. Whether it is marriage, parties, pub, disc or place of worship, people normally flout rules set by the local administration and create a nuisance in the area.

People play songs on full volume and dance till midnight, which makes the condition of people living nearby pretty worse. In markets, you can see people selling clothes via making a loud noise to attract the attention of people.

While this may not seem like much at the outset, over time, it affects the hearing abilities of the individuals who are constantly exposed to these sounds.

**4. Transportation**

A large number of vehicles on roads, airplanes flying over houses, underground trains produce heavy noise, and people find it difficult to get accustomed to that. The high noise leads to a situation where in a normal person loses the ability to hear properly.

**5. Construction Activities**

Under construction activities like mining, construction of bridges, dams, buildings, stations, roads, flyovers takes place in almost every part of the world. These construction activities take place every day as we need more buildings, bridges to accommodate more people.

However, while this does help us to some degree, in the long run, the noise from construction activities hinders the hearing abilities of individuals exposed to this sound.

**6. Household Chores**

We people are surrounded by gadgets and use them extensively in our daily life. Gadgets like TV, mobile, mixer grinder, pressure cooker, vacuum cleaners, washing machine and dryer, cooler, air conditioners are minor contributors to the amount of noise that is produced. Still, it affects the quality of life of your neighborhood in a bad way.

While this form of pollution may seem harmless, it, in fact, has far-reaching consequences. The adverse effects on the health of the environment are quite severe. Not only is the local wildlife affected by pollution, but humans also face a number of problems due to it.

**7. Noise from Air Traffic**

While many find it difficult to believe, air traffic too contributes to significant levels of noise pollution. Noise from a single aircraft may produce sounds of up to 130 dB. Now, imagine the amount of noise produced by the numerous aircraft traveling our airspace.

**8. Animals' Sound**

The noise made by animals cannot go unnoticed, particularly a howling or barking dog. These can produce noise around 60-80 dB.

## Effects of Noise Pollution on Human Health

### 1. Hearing Problems

Any unwanted sound that our ears have not been built to filter can cause problems within the body. Our ears can take in a certain range of sounds without getting damaged. Man-made noises such as jackhammers, horns, machinery, airplanes, and even vehicles can be too loud for our hearing range.

Constant exposure to loud levels of noise can easily result in the damage of our eardrums and loss of hearing, causing tinnitus or deafness. It also reduces our sensitivity to sounds that our ears pick up unconsciously to regulate our body's rhythm.

### 2. Psychological Issues

Excessive noise pollution in working areas such as offices, construction sites, bars and even in our homes can influence psychological health.

Studies show that the occurrence of aggressive behavior, disturbance of sleep, constant stress, fatigue, depression, anxiety, hysteria and hypertension in humans as well as animals can be linked to excessive noise levels. The level of irritation increases with increased noise, and people tend to become less and less patient. These, in turn, can cause more severe and chronic health issues later in life.

### 3. Physical Problems

Noise pollution can cause headaches, high blood pressure, respiratory agitation, racing pulse, and, in exposure to extremely loud, constant noise, gastritis, colitis and even heart attacks may occur.

### 4. Cognitive Issues & Behavioral Changes

Noise affects brain responses and people's ability to focus, which can lead to low-performance levels over time. Like other sound waves, too much noise when it goes to the brain leads to lower response rates as well as making the mind dull.

It is also poor for memory, making it hard to study. The studies have shown that school children living near railway stations or airports have problems in learning.

### 5. Sleeping Disorders

While it may not seem like much at this point, excessively high levels of noise are likely to hamper your sleeping pattern, thereby leading to irritation and uncomfortable situations.

Without a good night's sleep, you might experience multiple problems related to fatigue. This will affect your performance in the office as well as at home. It is therefore recommended to take a sound sleep to give your body proper rest. Interestingly, our ears need rest for 16 hours and even more to make up for two hours of exposure to 100 dB.

### 6. Cardiovascular Issues

Blood pressure levels, cardiovascular disease, and stress-related heart problems are on the rise. Studies suggest that high-intensity noise causes high blood pressure and increases heartbeat rate as it disrupts the normal blood flow.

### 7. Effect on Wildlife

Wildlife faces far more problems than humans because of noise pollution since they are more dependent on sound. Animals develop a better sense of hearing than us since their survival depends on it.

They become disoriented more easily and face many behavioral problems. In nature, animals may suffer from hearing loss, which makes them easy prey and leads to dwindling populations. Others become inefficient at hunting, disturbing the balance of the eco-system.

### Solutions to Lower Noise Pollution

WHO agrees that awareness of noise pollution is essential to beat this invisible enemy. As of now, there are not many solutions to reduce sound pollution. However, governments can help in the following ways:

- Establishing regulations that include preventive and corrective measures.
- Governments can take measures such as protecting certain areas, parts of the countryside, areas of natural interest, city parks, etc. to ensure noise management and reduce noise pollution.
- The mandatory separation between residential zones and sources of noise, like airports.
- Creating pedestrian areas where traffic is not allowed to enter other than offload goods at certain times.
- Fines for exceeding noise limits.
- Other ways to battle noise pollution are by controlling the sound levels in clubs, bars, parties, and discos.

- Removal of public loudspeakers is another way in which pollution can be countered.
- Again, better urban planning can help create ‘No-Noise’ zones, where honking and industrial noise is not tolerated.
- Replacing traditional asphalt with more efficient options can also help reduce traffic noise by up to 3 dB.

**On a personal level, everybody can help to reduce the noise in the following ways:**

- Keep checking the surrounding noise levels and limit the sounds that you produce.
- Stay in a green neighborhood full of trees as they are known to reduce the sound levels from 5 to 10 dB.
- Reduce noise in homes by lowering the volume of the radio, music system and the television.
- Avoid very noisy leisure activities and also going to areas that are too noisy.
- Doing your housework at the recommended time also makes a difference.
- Use proper noise absorbents in machines that make too much noise.
- Listening to music with headphones is also a good step forward.
- Use earplugs when you are in a noisy area because it lowers the overall noise of the surroundings.
- Try alternative means of transport such as bicycles or electric vehicles instead of taking the car.
- Get your vehicle checked regularly and lubricate it properly that it doesn’t produce too much noise.
- In the case of new buildings, you can insulate your home with noise-absorbing materials.

# Thermal Pollution

**Introduction**

When someone thinks of pollution, the idea of thermal pollution often doesn't come to mind. People will first think of things like carbon emissions, personal pollution and waste, and a variety of other changing factors.

However, thermal pollution is a real and persistent problem in our modern society. In layman's terms, thermal pollution is when an industry or other human-made organization takes in water from a natural source and either cools it down or heats it up. They then eject that water back into the natural resource, which changes the oxygen levels and can have disastrous effects on local ecosystems and communities.

जब कोई प्रदूषण के बारे में सोचता है, तो अक्सर थर्मल प्रदूषण का विचार दिमाग में नहीं आता है। लोग पहले कार्बन उत्सर्जन, व्यक्तिगत प्रदूषण और अपशिष्ट, और कई अन्य बदलते कारकों जैसी चीजों के बारे में सोचेंगे।
हालांकि, हमारे आधुनिक समाज में थर्मल प्रदूषण एक वास्तविक और लगातार समस्या है। आम आदमी के शब्दों में, थर्मल प्रदूषण तब होता है जब कोई उद्योग या अन्य मानव निर्मित संगठन प्राकृतिक स्रोत से पानी लेता है और या तो इसे ठंडा करता है या गर्म करता है। फिर वे उस पानी को वापस प्राकृतिक संसाधन में छोड़ देते हैं, जो ऑक्सीजन के स्तर को बदल देता है और स्थानीय पारिस्थितिक तंत्र और समुदायों पर विनाशकारी प्रभाव डाल सकता है।

**Meaning**

Thermal pollution is defined as a sudden increase or decrease in temperature of a natural body of water, which may be ocean, lake, river or pond by human influence. This normally occurs when a plant or facility takes in water from a natural resource and puts it back with an altered temperature. Usually, these facilities use it as a cooling method for their machinery or to help better produce their products.

Plants that produce different products or wastewater facilities are often the culprits of this massive exodus of thermal pollution. In order to properly control and maintain thermal pollution, humans and governments have been taking many steps to effectively manage how plants are able to use the water. However, the effects are still lasting today.

थर्मल प्रदूषण को पानी के प्राकृतिक शरीर के तापमान में अचानक वृद्धि या कमी के रूप में परिभाषित किया जाता  है, जो मानव प्रभाव से समुद्र, झील, नदी या तालाब हो सकता है। यह आमतौर पर तब होता है

जब कोई पौधा या सुविधा किसी प्राकृतिक संसाधन से पानी लेती है और उसे बदले हुए तापमान के साथ वापस रख देती है। आमतौर पर, ये सुविधाएं इसे अपनी मशीनरी के लिए शीतलन विधि के रूप में उपयोग करती हैं या अपने उत्पादों का बेहतर उत्पादन करने में मदद करती हैं।
विभिन्न उत्पादों या अपशिष्ट जल सुविधाओं का उत्पादन करने वाले पौधे अक्सर थर्मल प्रदूषण के इस बड़े पैमाने पर पलायन के अपराधी होते हैं। ऊष्मीय प्रदूषण को ठीक से नियंत्रित करने और बनाए रखने के लिए, मानव और सरकारें प्रभावी ढंग से प्रबंधन करने के लिए कई कदम उठा रही हैं कि पौधे पानी का उपयोग कैसे कर सकते हैं। हालांकि इसका असर आज भी कायम है।

**Causes of Thermal Pollution**

**1. Water as a Cooling Agent in Power, Manufacturing and Industrial Plants**

Production and Manufacturing plants are the biggest sources of thermal pollution. These plants draw water from a nearby source to keep machines cool and then release back to the source with higher temperatures. When heated water returns to the river or ocean, the water temperature rises sharply.

When oxygen levels are altered in the water, this can also degrade the quality and longevity of life in wildlife that lives underwater. This process can also wipe away streamside vegetation, which constantly depends on constant levels of oxygen and temperature.

By altering these natural environments, industries are essentially helping decrease the quality of life for these marine-based life forms, which can ultimately destroy habitats if they are not controlled and careful about their practices.

उत्पादन और विनिर्माण संयंत्र तापीय प्रदूषण के सबसे बड़े स्रोत हैं। ये पौधे मशीनों को ठंडा रखने के लिए पास के स्रोत से पानी खींचते हैं और फिर उच्च तापमान वाले स्रोत में वापस छोड़ देते हैं। जब गर्म पानी नदी या महासागर में लौटता है, तो पानी का तापमान तेजी से बढ़ता है।
जब पानी में ऑक्सीजन का स्तर बदल जाता है, तो यह पानी के भीतर रहने वाले वन्यजीवों के जीवन की गुणवत्ता और दीर्घायु को भी खराब कर सकता है। यह प्रक्रिया नदी के किनारे की वनस्पति को भी मिटा सकती है, जो लगातार ऑक्सीजन और तापमान के निरंतर स्तर पर निर्भर करती है।
इन प्राकृतिक वातावरणों को बदलकर, उद्योग अनिवार्य रूप से इन समुद्री-आधारित जीवन रूपों के लिए जीवन की गुणवत्ता को कम करने में मदद कर रहे हैं, जो अंततः आवासों को नष्ट कर सकते हैं यदि वे नियंत्रित नहीं हैं और उनकी प्रथाओं के बारे में सावधान नहीं हैं।

## 2. Soil Erosion

Soil erosion is another major factor that causes thermal pollution. Consistent soil erosion causes water bodies to rise, making them more exposed to sunlight. The high temperature could prove fatal for aquatic biomes as it may give rise to anaerobic conditions.

मृदा अपरदन एक अन्य प्रमुख कारक है जो तापीय प्रदूषण का कारण बनता है। लगातार मिट्टी के कटाव के कारण जल निकाय ऊपर उठते हैं, जिससे वे सूर्य के प्रकाश के संपर्क में आ जाते हैं। उच्च तापमान जलीय बायोम के लिए घातक साबित हो सकता है क्योंकि यह अवायवीय स्थितियों को जन्म दे सकता है।

## 3. Deforestation

Trees and plants prevent sunlight from falling directly on lakes, ponds or rivers. When deforestation takes place, these water bodies are directly exposed to sunlight, thus absorbing more heat and raising its temperature. Deforestation is also the main cause of the higher concentrations of greenhouse gases, i.e. global warming in the atmosphere.

पेड़ और पौधे सूरज की रोशनी को सीधे झीलों, तालाबों या नदियों पर गिरने से रोकते हैं। जब वनों की कटाई होती है, तो ये जल निकाय सीधे सूर्य के प्रकाश के संपर्क में आते हैं, इस प्रकार अधिक गर्मी को अवशोषित करते हैं और इसका तापमान बढ़ाते हैं। वनों की कटाई भी ग्रीनहाउस गैसों की उच्च सांद्रता का मुख्य कारण है, अर्थात वातावरण में ग्लोबल वार्मिंग।

## 4. Runoff from Paved Surfaces

Urban runoff discharged to surface waters from paved surfaces like roads and parking lots can make the water warmer. During summer seasons, the pavement gets quite hot, which creates warm runoffs that get into the sewer systems and water bodies.

सड़कों और पार्किंग स्थल जैसी पक्की सतहों से सतही जल में छोड़ा गया शहरी अपवाह पानी को गर्म बना सकता है। गर्मी के मौसम के दौरान, फुटपाथ काफी गर्म हो जाता है, जो गर्म अपवाह बनाता है जो सीवर सिस्टम और जल निकायों में मिल जाता है।

## 5. Natural Causes

Natural causes like volcanoes, geothermal vents and hot springs under the oceans and seas can trigger warm lava to raise the temperature of water bodies. Lightening can

also introduce a massive amount of heat into the oceans. This means that the overall temperature of the water source will rise, having significant impacts on the environment.

महासागरों और समुद्रों के नीचे ज्वालामुखी, भू-तापीय वेंट और गर्म झरने जैसे प्राकृतिक कारण जल निकायों के तापमान को बढ़ाने के लिए गर्म लावा को ट्रिगर कर सकते हैं। बिजली महासागरों में भारी मात्रा में गर्मी भी ला सकती है। इसका मतलब है कि जल स्रोत का समग्र तापमान बढ़ जाएगा, जिसका पर्यावरण पर महत्वपूर्ण प्रभाव पड़ेगा।

**6. Retention Ponds**

Retention ponds can be another source of thermal shock because the water bodies that are relatively small and shallow can absorb quite a bit of heat energy from the sun.

When that water is pumped directly into a river, lake, or bay, it causes a significant temperature increase. It is similar to pouring a hot pitcher of water into a bathtub full of water that causes the water to jump a few degrees Fahrenheit.

प्रतिधारण तालाब थर्मल शॉक का एक अन्य स्रोत हो सकता है क्योंकि जल निकाय जो अपेक्षाकृत छोटे और उथले होते हैं, वे सूर्य से काफी ऊष्मा ऊर्जा को अवशोषित कर सकते हैं।
जब उस पानी को सीधे किसी नदी, झील या खाड़ी में पंप किया जाता है, तो इससे तापमान में उल्लेखनीय वृद्धि होती है। यह पानी से भरे बाथटब में पानी का एक गर्म घड़ा डालने के समान है जिससे पानी कुछ डिग्री फ़ारेनहाइट कूद जाता है।

**7. Domestic Sewage**

Domestic sewage is often discharged into rivers, lakes, canals or streams without treating the waste. The temperature of municipal water sewage is normally high than receiving water. With the increase in temperature of the receiving water, the dissolved oxygen (DO) decreases, and the demand for oxygen increases, causing anaerobic conditions.

घरेलू सीवेज को अक्सर कचरे का उपचार किए बिना नदियों, झीलों, नहरों या नालों में छोड़ दिया जाता है। नगर निगम के पानी के सीवेज का तापमान सामान्य रूप से पानी प्राप्त करने से अधिक होता है। प्राप्त पानी के तापमान में वृद्धि के साथ, घुलित ऑक्सीजन (डीओ) कम हो जाती है, और ऑक्सीजन की मांग बढ़ जाती है, जिससे अवायवीय स्थिति पैदा हो जाती है।

## Effects of Thermal Pollution

Among recognized scientists and scholars, there are generally two schools of thought when it comes to the effects of thermal pollution. Some lean on the side of the negatives of this pollution on marine ecosystems and how it is detrimental to positive environmental practices.

However, some lean towards the side that without these industries operating the way they do, some of the most fundamental parts of human life would be completely obsolete.

Wastewater would not be able to be properly maintained; we would have no industries that could produce the goods we need, and so on. The effects of thermal pollution on ecosystems, however, greatly outweigh the benefits that industries have by participating in the act.

जब तापीय प्रदूषण के प्रभावों की बात आती है तो मान्यता प्राप्त वैज्ञानिकों और विद्वानों के बीच आम तौर पर दो विचारधाराएं होती हैं। कुछ लोग समुद्री पारिस्थितिक तंत्र पर इस प्रदूषण के नकारात्मक पक्ष पर झुकते हैं और यह सकारात्मक पर्यावरणीय प्रथाओं के लिए हानिकारक कैसे है।
हालाँकि, कुछ इस पक्ष की ओर झुकते हैं कि इन उद्योगों के संचालन के बिना, मानव जीवन के कुछ सबसे मौलिक हिस्से पूरी तरह से अप्रचलित हो जाएंगे।
अपशिष्ट जल का उचित रखरखाव नहीं किया जा सकेगा; हमारे पास कोई उद्योग नहीं होगा जो हमारी जरूरत के सामान का उत्पादन कर सके, और इसी तरह। पारिस्थितिक तंत्र पर थर्मल प्रदूषण के प्रभाव, हालांकि, अधिनियम में भाग लेने से उद्योगों को होने वाले लाभों से बहुत अधिक हैं।

### 1. Decrease in DO (Dissolved Oxygen) Levels

The warm temperature reduces the levels of DO (Dissolved Oxygen) in water. The warm water holds relatively less oxygen than cold water. The decrease in DO can create suffocation for plants and animals such as fish, amphibians and copepods, which may give rise to anaerobic conditions.

Warmer water allows algae to flourish on the surface of the water, and over the long term, growing algae can decrease oxygen levels in the water.

गर्म तापमान पानी में डीओ (डिसोल्व्ड ऑक्सीजन) के स्तर को कम कर देता है। गर्म पानी में ठंडे पानी की तुलना में अपेक्षाकृत कम ऑक्सीजन होती है। डीओ में कमी पौधों और जानवरों जैसे मछली, उभयचर और कोपपोड के लिए घुटन पैदा कर सकती है, जो अवायवीय स्थितियों को जन्म दे सकती है।

गर्म पानी शैवाल को पानी की सतह पर पनपने देता है, और लंबी अवधि में, शैवाल उगाने से पानी में ऑक्सीजन का स्तर कम हो सकता है।

**2. Increase in Toxins**

With the constant flow of high-temperature discharge from industries, there is a huge increase in toxins that are being regurgitated into the natural body of water. These toxins may contain chemicals or radiation that may have a harsh impact on the local ecology and make them susceptible to various diseases.

उद्योगों से उच्च तापमान के निर्वहन के निरंतर प्रवाह के साथ, विषाक्त पदार्थों में भारी वृद्धि हुई है जो पानी के प्राकृतिक शरीर में पुन: उत्पन्न हो रहे हैं। इन विषाक्त पदार्थों में रसायन या विकिरण हो सकते हैं जो स्थानीय पारिस्थितिकी पर कठोर प्रभाव डाल सकते हैं और उन्हें विभिन्न रोगों के लिए अतिसंवेदनशील बना सकते हैं।

**3. Loss of Biodiversity**

A dent in the biological activity in the water may cause a significant loss of biodiversity. Changes in the environment may cause certain species of organisms to shift their base to some other place while there could be a significant number of species that may shift in because of warmer waters.

पानी में जैविक गतिविधि में सेंध से जैव विविधता का महत्वपूर्ण नुकसान हो सकता है। पर्यावरण में परिवर्तन के कारण जीवों की कुछ प्रजातियाँ अपना आधार किसी अन्य स्थान पर स्थानांतरित कर सकती हैं, जबकि बड़ी संख्या में ऐसी प्रजातियाँ हो सकती हैं जो गर्म पानी के कारण स्थानांतरित हो सकती हैं।

**4. Ecological Impact**

A sudden thermal shock can result in mass killings of fish, insects, plants or amphibians. Hotter water may prove favorable for some species, while it could be lethal for other species. Small water temperature increases the level of activity, while higher temperature decreases the level of activity.

Many aquatic species are sensitive to small temperature changes such as one degree Celsius that can cause significant changes in organism metabolism and other adverse cellular biology effects.

अचानक थर्मल शॉक के परिणामस्वरूप मछलियों, कीड़ों, पौधों या उभयचरों की सामूहिक हत्या हो सकती है। गर्म पानी कुछ प्रजातियों के लिए अनुकूल साबित हो सकता है, जबकि अन्य प्रजातियों के लिए यह

घातक हो सकता है। छोटे पानी का तापमान गतिविधि के स्तर को बढ़ाता है, जबकि उच्च तापमान गतिविधि के स्तर को कम करता है।
कई जलीय प्रजातियां छोटे तापमान परिवर्तनों के प्रति संवेदनशील होती हैं जैसे कि एक डिग्री सेल्सियस जो जीवों के चयापचय में महत्वपूर्ण परिवर्तन और अन्य प्रतिकूल सेलुलर जीव विज्ञान प्रभावों का कारण बन सकता है।

**5. Affects Reproductive Systems**

A significant halt in the reproduction of marine wildlife (although this may be true, reproduction can still occur between fish – but the likelihood of defects in newborns is significantly higher) can happen due to increasing temperatures as reproduction can happen within a certain range of temperature. Excessive temperature can cause the release of immature eggs or can prevent the normal development of certain eggs.

समुद्री वन्यजीवों के प्रजनन में एक महत्वपूर्ण रुकावट (हालांकि यह सच हो सकता है, मछली के बीच प्रजनन अभी भी हो सकता है - लेकिन नवजात शिशुओं में दोषों की संभावना काफी अधिक है) बढ़ते तापमान के  कारण हो सकता है क्योंकि प्रजनन तापमान की एक निश्चित सीमा के भीतर हो सकता है। . अत्यधिक तापमान अपरिपक्व अंडों के निकलने का कारण बन सकता है या कुछ अंडों के सामान्य विकास को रोक सकता है।

**6. Increases Metabolic Rate**

Thermal pollution increases the metabolic rate of organisms as increasing enzyme activity occurs that causes organisms to consume more food than what is normally required if their environment were not changed. It disrupts the stability of the food chain and alters the balance of species composition.

ऊष्मीय प्रदूषण जीवों की चयापचय दर को बढ़ाता है क्योंकि बढ़ती एंजाइम गतिविधि होती है जिसके कारण जीव अपने पर्यावरण को नहीं बदलने पर सामान्य रूप से आवश्यकता से अधिक भोजन का उपभोग करते हैं। यह खाद्य श्रृंखला की स्थिरता को बाधित करता है और प्रजातियों की संरचना के संतुलन को बदल देता है।

**7. Migration**

The warm water can also cause particular species of organisms to migrate to a suitable environment that would cater to its requirements for survival. This can result in a loss for those species that depend on them for their daily food as their food chain is interrupted.

गर्म पानी जीवों की विशेष प्रजातियों को एक उपयुक्त वातावरण में स्थानांतरित करने का कारण बन सकता है जो जीवित रहने के लिए इसकी आवश्यकताओं को पूरा करेगा। इससे उन प्रजातियों को नुकसान हो सकता है जो अपने दैनिक भोजन के लिए उन पर निर्भर हैं क्योंकि उनकी खाद्य श्रृंखला बाधित है।

## Solution of Thermal Pollution

Solution of thermal pollution is required for its detrimental effects on the aquatic ecosystem in the future. A number of methods have been suggested and developed to convert the thermal effluents from power plants into useful heat resources for maximizing the benefits. The solutions to thermal discharge into water bodies are as follows:

भविष्य में जलीय पारिस्थितिकी तंत्र पर इसके हानिकारक प्रभावों के लिए तापीय प्रदूषण का समाधान आवश्यक है। लाभ को अधिकतम करने के लिए बिजली संयंत्रों से थर्मल अपशिष्टों को उपयोगी ताप संसाधनों में परिवर्तित करने के लिए कई तरीकों का सुझाव दिया गया है और विकसित किया गया है। जल निकायों में थर्मल डिस्चार्ज के समाधान इस प्रकार हैं:

### 1. Cooling Ponds

Cooling ponds or reservoirs are the simplest methods of controlling thermal discharges. In cooling ponds, heated effluents on the surface of water maximize the dissipation of heat to the atmosphere and minimize the area and volume of water.

This is the simplest and cheapest method that cools the water to a considerably low temperature. However, the method alone is less desirable as well as inefficient in terms of air-water contact.

थर्मल डिस्चार्ज को नियंत्रित करने के लिए तालाबों या जलाशयों को ठंडा करना सबसे सरल तरीका है। ठंडे तालाबों में, पानी की सतह पर गर्म अपशिष्ट वातावरण में गर्मी के अपव्यय को अधिकतम करते हैं और पानी के क्षेत्र और मात्रा को कम करते हैं।
यह सबसे सरल और सस्ता तरीका है जो पानी को काफी कम तापमान तक ठंडा करता है। हालांकि, अकेले विधि कम वांछनीय है और साथ ही वायु-जल संपर्क के मामले में अक्षम भी है।

### 2. Cooling Towers

After using water from water sources for cooling purposes, it is subsequently returned to the water body after passing through the condenser, which is termed as the cooling process.

Therefore cooling towers are designed to control the temperature of water to make the cooling process more effective. Cooling towers are mainly used to dissipate the recovered waste heat to eliminate the problems of thermal pollution.

जल स्रोतों से पानी को ठंडा करने के लिए उपयोग करने के बाद, इसे बाद में कंडेनसर से गुजरने के बाद जल निकाय में वापस कर दिया जाता है, जिसे शीतलन प्रक्रिया कहा जाता है।
इसलिए कूलिंग टावर्स को कूलिंग प्रक्रिया को और अधिक प्रभावी बनाने के लिए पानी के तापमान को नियंत्रित करने के लिए डिज़ाइन किया गया है। कूलिंग टावरों का उपयोग मुख्य रूप से ऊष्मीय प्रदूषण की समस्याओं को खत्म करने के लिए अपशिष्ट गर्मी को नष्ट करने के लिए किया जाता है।

### 3. Artificial Lake

Artificial lakes are man-made water bodies that offer a possible alternative. The heated effluents may be discharged into the lake at one end, and the water may be withdrawn from the other end for cooling purposes. The heat is eventually dissipated through evaporation. However, these lakes have to be rejuvenated continuously.

कृत्रिम झीलें मानव निर्मित जल निकाय हैं जो एक संभावित विकल्प प्रदान करते हैं। गर्म किए गए अपशिष्टों को एक छोर पर झील में छोड़ा जा सकता है, और दूसरे छोर से ठंडा करने के उद्देश्य से पानी निकाला जा सकता है। गर्मी अंततः वाष्पीकरण के माध्यम से समाप्त हो जाती है। हालांकि, इन झीलों का लगातार कायाकल्प करना होगा।

### 4. Water Recycling

Industrially treated water can be recycled for domestic use or industrial heating that the problem of thermal pollution can be mitigated.

औद्योगिक रूप से उपचारित जल को घरेलू उपयोग या औद्योगिक तापन के लिए पुनर्चक्रित किया जा सकता है जिससे तापीय प्रदूषण की समस्या को कम किया जा सके।

### 5. Other Applications

The thermal discharge (rejected heat) of power plants can be used in other purposes like:

- Industrial and space heating.
- Biological applications such as soil warming.
- Fish culture, livestock shelters and heating greenhouses.

बिजली संयंत्रों  के थर्मल डिस्चार्ज (अस्वीकार गर्मी) का उपयोग अन्य उद्देश्यों में किया जा सकता है जैसे:

- औद्योगिक और अंतरिक्ष हीटिंग।
- जैविक अनुप्रयोग जैसे मिट्टी का गर्म होना।
- मछली पालन, पशुधन आश्रय और हीटिंग ग्रीनहाउस।

# Radioactive Pollution

Radioactive pollution occurs when there is a presence or depositions of radioactive materials in the atmosphere or environment, especially where their presence is accidental and when it presents an environmental threat due to radioactive decay. The destruction caused by the radioactive materials is because of the emissions of hazardous ionizing radiation (radioactive decay) like beta or alpha particles, gamma rays or neurons in the environment where they exist.

Since the substances are characterized by radiation – because there is a lot of instability of the particles present in the radioactive materials, it can seriously affect, alter and even destroy plant, animal, and human life. The extent of damage or danger posed to the environment depends upon the radioactive material concentration, the energy emitted by the radiation, proximity of the radioactive materials to those exposed, and the radiation type.

रेडियोधर्मी प्रदूषण तब होता है जब वातावरण या वातावरण में रेडियोधर्मी पदार्थों की उपस्थिति या जमाव होता है, विशेष रूप से जहां उनकी उपस्थिति आकस्मिक होती है और जब यह रेडियोधर्मी क्षय के कारण पर्यावरणीय खतरा प्रस्तुत करता है। रेडियोधर्मी पदार्थों के कारण होने वाला विनाश खतरनाक आयनकारी विकिरण (रेडियोधर्मी क्षय) जैसे बीटा या अल्फा कणों, गामा किरणों या न्यूरॉन्स के वातावरण में उत्सर्जन के कारण होता है जहां वे मौजूद होते हैं।

चूंकि पदार्थों को विकिरण की विशेषता होती है - क्योंकि रेडियोधर्मी पदार्थों में मौजूद कणों की अस्थिरता बहुत अधिक होती है, यह पौधे, पशु और मानव जीवन को गंभीर रूप से प्रभावित, बदल और नष्ट कर सकता है। पर्यावरण को होने वाले नुकसान या खतरे की सीमा रेडियोधर्मी सामग्री की एकाग्रता, विकिरण द्वारा उत्सर्जित ऊर्जा, रेडियोधर्मी पदार्थों की निकटता और विकिरण के प्रकार पर निर्भर करती है।

### Causes of Radioactive Pollution

### 1. Nuclear Accidents from Nuclear Energy Generation Plants

In the postmodern world, various forms of energy are being discovered. Among them is nuclear energy, which is touted to be the most potent source of energy due to its high

latent power. Reports indicate that the high latent power is due to its high level of radiation.

Its use is, therefore, prohibited, but research is underway to determine its environmental safety and to put in place the most appropriate precautionary measures for its use. In some cases and countries, however, nuclear power plant accidents like the Fukushima Daiichi nuclear disaster (2011), Chernobyl disaster (1986), and Three Mile Island accident (1979) left many dead and even many more affected by the radiation released.

उत्तर आधुनिक दुनिया में, ऊर्जा के विभिन्न रूपों की खोज की जा रही है। उनमें से परमाणु ऊर्जा है, जिसे इसकी उच्च गुप्त शक्ति के कारण ऊर्जा का सबसे शक्तिशाली स्रोत माना जाता है। रिपोर्टों से संकेत मिलता है कि उच्च गुप्त शक्ति इसके उच्च स्तर के विकिरण के कारण है।
इसलिए, इसका उपयोग निषिद्ध है, लेकिन इसकी पर्यावरणीय सुरक्षा का निर्धारण करने और इसके उपयोग के लिए सबसे उपयुक्त एहतियाती उपाय करने के लिए अनुसंधान चल रहा है। हालांकि, कुछ मामलों और देशों में, फुकुशिमा दाइची परमाणु आपदा (2011), चेरनोबिल आपदा (1986), और थ्री माइल आइलैंड दुर्घटना (1979) जैसी परमाणु ऊर्जा संयंत्र दुर्घटनाओं ने कई लोगों की जान ले ली और विकिरण से बहुत अधिक प्रभावित हुए।

**2. The Use of Nuclear Weapons as Weapons of Mass Destruction (WMD)**

The use of nuclear missiles and atomic bombs, a form of nuclear energy, in the Second World War explains not only the cause but also the damaging nature of radioactive pollution or contamination.

The effects of those two strikes in Hiroshima and Nagasaki that prompted the end of the war in 1945 have been seen to date with children born with complications such as mental retardation as well as conditions like autism and other disorders. The number of cancer cases present in the two towns is more than those of the rest of Japan.

द्वितीय विश्व युद्ध में परमाणु मिसाइलों और परमाणु बमों का उपयोग, परमाणु ऊर्जा का एक रूप, न केवल  कारण बताता है बल्कि रेडियोधर्मी प्रदूषण या प्रदूषण की हानिकारक प्रकृति भी बताता है।
1945 में युद्ध की समाप्ति के लिए प्रेरित हिरोशिमा और नागासाकी में उन दो हमलों के प्रभाव आज तक मानसिक मंदता जैसी जटिलताओं के साथ पैदा हुए बच्चों के साथ-साथ ऑटिज़्म और अन्य विकारों जैसी स्थितियों के साथ देखे गए हैं। दोनों शहरों में मौजूद कैंसर के मामलों की संख्या जापान के बाकी हिस्सों की तुलना में अधिक है।

### 3. Use of Radioisotopes

Radioisotopes are used to make detectors and in other industrial activities. Isotopes such as uranium have high concentrations of radiation in them. On the other hand, common Isotopes such as carbon-containing radioactive material are easily found in waterways through sewage lines.

Since most of the raw sewage is untreated before release, once released, the isotope combines with other compounds and elements present in water. This is the same water that people fetch for domestic use. Moreover, fishes use the same water to survive. Consumption of these fishes and from contaminated water sources means the potential intake of radiation.

रेडियोआइसोटोप का उपयोग डिटेक्टर बनाने और अन्य औद्योगिक गतिविधियों में किया जाता है। यूरेनियम जैसे समस्थानिकों में विकिरण की उच्च सांद्रता होती है। दूसरी ओर, कार्बन युक्त रेडियोधर्मी सामग्री जैसे सामान्य समस्थानिक जलमार्गों में सीवेज लाइनों के माध्यम से आसानी से मिल जाते हैं।
चूंकि अधिकांश कच्चे सीवेज को छोड़ने से पहले अनुपचारित किया जाता है, एक बार छोड़े जाने के बाद, आइसोटोप पानी में मौजूद अन्य यौगिकों और तत्वों के साथ जुड़ जाता है। यह वही पानी है जो लोग घरेलू उपयोग के लिए लाते हैं। इसके अलावा, मछलियाँ जीवित रहने के लिए उसी पानी का उपयोग करती हैं। इन मछलियों के सेवन और दूषित जल स्रोतों से मतलब विकिरण का संभावित सेवन है।

### 4. Mining

Mining mostly involves the excavation of the mineral ores, which are then broken into smaller, manageable pieces. Radium and Uranium, for instance, are naturally occurring in the environment and are equally radioactive.

Hence, mining increases the natural geological processes by moving these materials from underneath the earth to the surface. Other minerals with a hint of radiation are thorium, plutonium, radon, potassium, carbon and phosphorus.

खनन में ज्यादातर खनिज अयस्कों की खुदाई शामिल होती है, जिन्हें बाद में छोटे, प्रबंधनीय टुकड़ों में तोड़ दिया जाता है। उदाहरण के लिए, रेडियम और यूरेनियम प्राकृतिक रूप से पर्यावरण में पाए जाते हैं और समान रूप से रेडियोधर्मी हैं।
इसलिए, खनन इन सामग्रियों को पृथ्वी के नीचे से सतह पर ले जाकर प्राकृतिक भूवैज्ञानिक प्रक्रियाओं को बढ़ाता है। विकिरण के संकेत वाले अन्य खनिज थोरियम, प्लूटोनियम, रेडॉन, पोटेशियम, कार्बन और फास्फोरस हैं।

### 5. Spillage of Radioactive Chemicals

There have been instances of spillages over oceans when ships hit glaciers or coral reefs and end up releasing chemicals on waterways and in the atmosphere. The majority of these chemicals, including petroleum products, have a significant level of radiation, which can be detrimental to the environment.

महासागरों पर छलकाव के उदाहरण हैं जब जहाज ग्लेशियरों या प्रवाल भित्तियों से टकराते हैं और जलमार्गों और वातावरण में रसायनों को छोड़ते हैं। पेट्रोलियम उत्पादों सहित इनमें से अधिकांश रसायनों में विकिरण का एक महत्वपूर्ण स्तर होता है, जो पर्यावरण के लिए हानिकारक हो सकता है

**6. Tests on Radiation**

Radiation has been seen to have a lot of interesting properties, which has promoted a lot of scientists to conduct tests to learn more about it. It is one of the key elements in the cure and treatment of cancer.

Chemotherapy, a cancer curative health initiative, uses radiation to prevent further growth of the cancer cells as well as keep the immune system strong. Despite this, scientists have been exposed to radiation leading to their deaths or other complications.

As per the report to the UN General Assembly in 2000, nuclear testing is the main reason for human exposure to radioactivity caused by man.

यह देखा गया है कि विकिरण में बहुत सारे दिलचस्प गुण होते हैं, जिसने बहुत से वैज्ञानिकों को इसके बारे में अधिक जानने के लिए परीक्षण करने के लिए प्रोत्साहित किया है। यह कैंसर के इलाज और उपचार में प्रमुख तत्वों में से एक है।
कीमोथेरेपी, एक कैंसर उपचारात्मक स्वास्थ्य पहल, कैंसर कोशिकाओं के आगे विकास को रोकने के साथ-साथ प्रतिरक्षा प्रणाली को मजबूत रखने के लिए विकिरण का उपयोग करती है। इसके बावजूद, वैज्ञानिकों को विकिरण के संपर्क में लाया गया है जिससे उनकी मृत्यु या अन्य जटिलताएं हो रही हैं।
2000 में संयुक्त राष्ट्र महासभा की रिपोर्ट के अनुसार, परमाणु परीक्षण मनुष्य द्वारा रेडियोधर्मिता के कारण मानव के संपर्क में आने का मुख्य कारण है।

**7. Cosmic Rays and Other Natural Sources**

These come from the outer space to our planet with intense radiation as their nature, therefore, causing radioactive pollution. Gamma rays, for example, are said to have the highest level of radiation and yet, depending on their intensity, some are not visible to the human eye. The quantity with which the rays hit the earth depends on the altitude of the earth and the geographical location.

There may be terrestrial radiations from radioactive elements present in the earth's crust. These radioactive elements include potassium 40, radium 224, radon 222, thorium 232, uranium 235, uranium 238, and carbon 14 and occur in rocks, soil and water.

There can also be unstable radio-nuclides split into smaller parts emitting energetic radiation that can enter into the body of organisms through the air during respiration.

ये बाहरी अंतरिक्ष से हमारे ग्रह पर अपनी प्रकृति के रूप में तीव्र विकिरण के साथ आते हैं, इसलिए, रेडियोधर्मी प्रदूषण का कारण बनते हैं। उदाहरण के लिए, गामा किरणों को विकिरण का उच्चतम स्तर कहा जाता है और फिर भी, उनकी तीव्रता के आधार पर, कुछ मानव आंखों को दिखाई नहीं देती हैं। पृथ्वी पर किरणें जितनी मात्रा से टकराती हैं, वह पृथ्वी की ऊंचाई और भौगोलिक स्थिति पर निर्भर करती है।
पृथ्वी की पपड़ी में मौजूद रेडियोधर्मी तत्वों से स्थलीय विकिरण हो सकते हैं। इन रेडियोधर्मी तत्वों में पोटेशियम 40, रेडियम 224, रेडॉन 222, थोरियम 232, यूरेनियम 235, यूरेनियम 238 और कार्बन 14 शामिल हैं और चट्टानों, मिट्टी और पानी में पाए जाते हैं।
अस्थिर रेडियो-न्यूक्लाइड भी छोटे भागों में विभाजित हो सकते हैं जो ऊर्जावान विकिरण उत्सर्जित करते हैं जो श्वसन के दौरान हवा के माध्यम से जीवों के शरीर में प्रवेश कर सकते हैं।

### 8. Defensive Weapon Production

The productions of defensive weapons that may release radioactivity from the radioactive materials handled usually have high health risks. However, the current standards will not allow the release of any significant amount of radiation unless an accident occurs.

रक्षात्मक हथियारों का निर्माण जो रेडियोधर्मी सामग्री से रेडियोधर्मिता को मुक्त कर सकता है, आमतौर पर उच्च स्वास्थ्य जोखिम होता है। हालांकि, मौजूदा मानक किसी भी महत्वपूर्ण मात्रा में विकिरण की रिहाई की अनुमति नहीं देंगे जब तक कि कोई दुर्घटना न हो।

## Effects of Radioactive Pollution

### 1. Diseases

Cancer is the most dominant radiation-related disease. It has developed over the years and poses a great risk in global health. Others include leukemia, anemia, hemorrhage, a reduction in the life span leading to premature aging and premature deaths as well as others such as cardiovascular complications. Leukemia, for instance, is caused by radiation in the bone marrow.

कैंसर सबसे प्रमुख विकिरण से संबंधित बीमारी है। यह वर्षों में विकसित हुआ है और वैश्विक स्वास्थ्य के लिए एक बड़ा जोखिम है। अन्य में ल्यूकेमिया, एनीमिया, रक्तस्राव, जीवन काल में कमी से समय से पहले बूढ़ा होना और समय से पहले मृत्यु के साथ-साथ अन्य जैसे हृदय संबंधी जटिलताएं शामिल हैं। उदाहरण के लिए, ल्यूकेमिया अस्थि मज्जा में विकिरण के कारण होता है।

**2. Soil Infertility**

Exposure of radiation to the atmosphere means it is present even in soils. Radioactive substances in the soil react together with the various nutrients leading to the destruction of those nutrients, thus rendering the soil infertile and highly toxic.

Such soil leads to the harvest of crops that are riddled with radiation and thus, unfit for consumption by both humans and animals.

Plants that grow from such soil are also genetically modified. Since these are at the base of the food chain, the herbivores consume them and retain the radiation levels. The carnivores such as lions, vultures end up consuming them and increasing their levels of radiation – explained through the concept of Biomagnification.

वायुमंडल में विकिरण के संपर्क में आने का मतलब है कि यह मिट्टी में भी मौजूद है। मिट्टी में रेडियोधर्मी पदार्थ विभिन्न पोषक तत्वों के साथ प्रतिक्रिया करके उन पोषक तत्वों को नष्ट कर देते हैं, जिससे मिट्टी उपजाऊ और अत्यधिक जहरीली हो जाती है।
ऐसी मिट्टी से फसलों की कटाई होती है जो विकिरण से ग्रस्त हैं और इस प्रकार, मनुष्यों और जानवरों दोनों के उपभोग के लिए अनुपयुक्त हैं।
ऐसी मिट्टी से उगने वाले पौधे भी आनुवंशिक रूप से संशोधित होते हैं। चूंकि ये खाद्य श्रृंखला के आधार पर हैं, इसलिए शाकाहारी लोग इनका सेवन करते हैं और विकिरण के स्तर को बनाए रखते हैं। शेर, गिद्ध जैसे मांसाहारी अंत में उनका उपभोग करते हैं और उनके विकिरण के स्तर को बढ़ाते हैं - बायोमैग्निफिकेशन की अवधारणा के माध्यम से समझाया गया।

**3. Cell Destruction**

Radioactive pollution has diverse effects, such as the alteration of cells. The bodies of living organisms are unique as within it, there are millions of cells in one single body, where each has its own purpose to fulfill. Radiation distorts the cells present, leading to permanent damage of the various organs and organ systems. In the face of too much radiation, permanent illnesses and death are inevitable.

रेडियोधर्मी प्रदूषण के विविध प्रभाव होते हैं, जैसे कोशिकाओं में परिवर्तन। जीवों के शरीर अद्वितीय हैं क्योंकि इसके भीतर एक ही शरीर में लाखों कोशिकाएँ होती हैं, जहाँ प्रत्येक का अपना उद्देश्य होता है। विकिरण मौजूद कोशिकाओं को विकृत कर देता है, जिससे विभिन्न अंगों और अंग प्रणालियों को स्थायी नुकसान होता है। बहुत अधिक विकिरण के सामने, स्थायी बीमारियाँ और मृत्यु अपरिहार्य हैं।

**4. Burns**

Radiation is not easy to feel, but it is easy to realize that you have been affected by it. The immediate presence of burns, red lesions and sores is evidence. To make it worse, this can lead to skin cancer.

विकिरण को महसूस करना आसान नहीं है, लेकिन यह महसूस करना आसान है कि आप इससे प्रभावित हुए हैं। जलन, लाल घाव और घावों की तत्काल उपस्थिति इसका प्रमाण है। इसे बदतर बनाने के लिए, इससे त्वचा कैंसर हो सकता है।

**5. Effects on Wildlife**

The animals at different levels suffer differently. The higher-level organisms get more affected than insects and flies. Herbivores, such as cattle, when grazing the contaminated land, the deposited Ce-13 and I-131 get accumulated on the animal tissues in a large amount.

These radio nuclides entered their metabolic cycles and affect their DNAs (mentioned above; ionizing). This ends up having a mutated animal generation with a higher risk of health issues by just a small amount of radionuclides.

अलग-अलग स्तरों पर जानवर अलग-अलग तरह से पीड़ित होते हैं। उच्च स्तर के जीव कीड़ों और मक्खियों की तुलना में अधिक प्रभावित होते हैं। शाकाहारियों, जैसे मवेशी, दूषित भूमि को चराने पर, जमा सीई-१३ और आई-१३१ बड़ी मात्रा में जानवरों के ऊतकों पर जमा हो जाते हैं।
ये रेडियो न्यूक्लाइड अपने चयापचय चक्रों में प्रवेश करते हैं और उनके डीएनए को प्रभावित करते हैं (ऊपर उल्लिखित; आयनीकरण)। यह एक उत्परिवर्तित पशु पीढ़ी को समाप्त करता है जिसमें केवल थोड़ी मात्रा में रेडियोन्यूक्लाइड द्वारा स्वास्थ्य संबंधी समस्याओं का उच्च जोखिम होता है।

**6. Effects on Plants**

The plants are also exposed to radiation, and the damage is mostly done due to the increased Ultraviolet waves. Different plants get affected differently.

The stomata stop to evaporate during the increase of radiation. When the radiation hits the chromosomes, the reproduction gets hampered. It results in altered shapes, sizes and health in plants. Exposure in high amounts destroys the affected plants. When we eat these plants, we ingest nuclides.

पौधे भी विकिरण के संपर्क में आते हैं, और नुकसान ज्यादातर अल्ट्रावाइलेट तरंगों में वृद्धि के कारण होता है। विभिन्न पौधे अलग-अलग प्रभावित होते हैं।
विकिरण के बढ़ने पर रंध्र वाष्पित होना बंद हो जाते हैं। जब विकिरण गुणसूत्रों से टकराता है, तो प्रजनन बाधित हो जाता है। इसके परिणामस्वरूप पौधों के आकार, आकार और स्वास्थ्य में परिवर्तन होता है। अधिक मात्रा में एक्सपोजर प्रभावित पौधों को नष्ट कर देता है। जब हम इन पौधों को खाते हैं, तो हम न्यूक्लाइड का अंतर्ग्रहण करते हैं।

### 7. Effects on Marine life

The power plants, which are the sources of nuclear energy and chemical processing, have been releasing radioisotopes into the water for decades. Cesium, Radon, Crypton, Ruthenium, Zinc and Copper are few of them. Though the waste is released in a “permissible” amount, it does not mean safe.

These radio nuclides can be detected in the soft tissues or on the bones of the fishes. The sea-weed used in bread was said to have radioisotope of ruthenium. The shells of all shelled fishes and the tissues of fishes are contaminated with radionuclide.

बिजली संयंत्र, जो परमाणु ऊर्जा और रासायनिक प्रसंस्करण के स्रोत हैं, दशकों से रेडियोआइसोटोप को पानी में छोड़ रहे हैं। सीज़ियम, रेडॉन, क्रिप्टन, रूथेनियम, जिंक और कॉपर उनमें से कुछ हैं। हालांकि कचरे को "अनुमेय" मात्रा में छोड़ा जाता है, लेकिन इसका मतलब सुरक्षित नहीं है।
इन रेडियो न्यूक्लाइड का पता कोमल ऊतकों में या मछलियों की हड्डियों पर लगाया जा सकता है। कहा जाता है कि ब्रेड में इस्तेमाल होने वाले समुद्री खरपतवार में रूथेनियम का रेडियोआइसोटोप होता है। सभी खोलीदार मछलियों के खोल और मछलियों के ऊतक रेडियोन्यूक्लाइड से दूषित होते हैं।

## Solutions to Radioactive Pollution

### 1. Proper Method of Disposing of Radioactive Waste

Radioactive waste still has some level of radiation. Accordingly, it cannot be disposed of in the same way as normal waste. It cannot be incinerated or buried. Since there is a likelihood of seepage, this waste should be stored in heavy and thick concrete containers.

Another option is to dilute the radiation since storage may not be possible. Since there are no easy ways of disposing of radioactive material, professional assistance should always be sought.

रेडियोधर्मी कचरे में अभी भी कुछ स्तर का विकिरण होता है। तदनुसार, इसे सामान्य कचरे की तरह ही निपटाया नहीं जा सकता है। इसे जलाया या दफनाया नहीं जा सकता। चूंकि रिसाव की संभावना होती है, इसलिए इस कचरे को भारी और मोटे कंक्रीट के कंटेनरों में संग्रहित किया जाना चाहिए।
एक अन्य विकल्प विकिरण को पतला करना है क्योंकि भंडारण संभव नहीं हो सकता है। चूंकि रेडियोधर्मी सामग्री के निपटान का कोई आसान तरीका नहीं है, इसलिए हमेशा पेशेवर सहायता लेनी चाहिए।

**2. Proper Labeling**

It is necessary for any material with radioactive content to be labeled, and the necessary precautions advised on the content of the label. The reason for this is because radiation can enter the body by a mere touch of radioactive material. Containers with such elements should be well labeled in order to make one use protective gear when handling them.

रेडियोधर्मी सामग्री वाली किसी भी सामग्री को लेबल किया जाना आवश्यक है, और लेबल की सामग्री पर आवश्यक सावधानियों की सलाह दी जाती है। इसका कारण यह है कि रेडियोधर्मी पदार्थ के स्पर्श मात्र से विकिरण शरीर में प्रवेश कर सकता है। ऐसे तत्वों वाले कंटेनरों को अच्छी तरह से लेबल किया जाना चाहिए ताकि उन्हें संभालते समय एक सुरक्षात्मक गियर का उपयोग किया जा सके।

**3. Banning of Nuclear Tests**

It has already been proven that nuclear power has a lot of latent power that is very destructive. Nevertheless, the tests done to perfect the energy contribute greatly to the overall presence of radioactive substances. Moreover, these tests, though done in the deserts, end up escaping from one ecosystem to another, eventually affecting the lives of many people.

यह पहले ही सिद्ध हो चुका है कि परमाणु शक्ति में बहुत अधिक अव्यक्त शक्ति होती है जो बहुत विनाशकारी होती है। फिर भी, ऊर्जा को परिपूर्ण करने के लिए किए गए परीक्षण रेडियोधर्मी पदार्थों की समग्र उपस्थिति में बहुत योगदान करते हैं। इसके अलावा, ये परीक्षण, हालांकि रेगिस्तान में किए जाते हैं, एक पारिस्थितिकी तंत्र से दूसरे पारिस्थितिकी तंत्र में पलायन करते हैं, अंततः कई लोगों के जीवन को प्रभावित करते हैं।

**4. Alternative Energy Sources:**

The evolution and use of nuclear power was not a bad thing initially. However, considering the damage and threats it has on the environment, it is high time for its use to be discontinued and for the world to perhaps focus on alternative and environmentally friendly energy sources – like renewable sources of energy namely solar, hydro-electric and wind power.

The use of radioactivity to generate energy in nuclear power plants, for example, leads to the production of more radiation to the atmosphere considering the waste released from the various processes and combustion.

परमाणु शक्ति का विकास और उपयोग शुरू में कोई बुरी बात नहीं थी। हालांकि, पर्यावरण पर इसके नुकसान और खतरों को देखते हुए, इसके उपयोग को बंद करने और दुनिया के लिए वैकल्पिक और पर्यावरण के अनुकूल ऊर्जा स्रोतों पर ध्यान केंद्रित करने का समय आ गया है - जैसे ऊर्जा के नवीकरणीय स्रोत जैसे सौर, हाइड्रो-इलेक्ट्रिक और पवन ऊर्जा।
उदाहरण के लिए, परमाणु ऊर्जा संयंत्रों में ऊर्जा उत्पन्न करने के लिए रेडियोधर्मिता का उपयोग, विभिन्न प्रक्रियाओं और दहन से निकलने वाले कचरे को देखते हुए वातावरण में अधिक विकिरण का उत्पादन करता है।

**5. Proper Storage**

It is mandatory for containers carrying radioactive material to be stored properly. For starters, such substances should be stored in radiation proof containers to ensure no seeping or leakage during handling. Proper storage means no harm and can minimize cases of accidental leakage.

रेडियोधर्मी सामग्री ले जाने वाले कंटेनरों को ठीक से संग्रहित करना अनिवार्य है। शुरुआत के लिए, ऐसे पदार्थों को विकिरण प्रूफ कंटेनरों में संग्रहित किया जाना चाहिए ताकि यह सुनिश्चित किया जा सके कि हैंडलिंग के दौरान कोई रिसाव या रिसाव न हो। उचित भंडारण का मतलब कोई नुकसान नहीं है और आकस्मिक रिसाव के मामलों को कम कर सकता है।

**6. Reusing**

Since it is not easy to store or dispose the waste, it can be recycled and used for other purposes like in another reactor as fuel thereby protecting the environment.

चूंकि कचरे को स्टोर करना या निपटाना आसान नहीं है, इसलिए इसे पुनर्नवीनीकरण किया जा सकता है और अन्य उद्देश्यों के लिए इस्तेमाल किया जा सकता है जैसे कि एक अन्य रिएक्टर में ईंधन के रूप में जिससे पर्यावरण की रक्षा होती है।

### 7. Precautions at the Personal Level

There may be the possibility of contamination if one owns a house located near a nuclear power plant. In that case, it is recommended to check the level of radon gas in your building. The radon level needs to be removed. Those who work with radioactive material are also at great risk. They need protective measures to keep away from radioactive contamination.

परमाणु ऊर्जा संयंत्र के पास स्थित घर का मालिक होने पर संदूषण की संभावना हो सकती है। उस स्थिति में, आपके भवन में रेडॉन गैस के स्तर की जांच करने की अनुशंसा की जाती है। रेडॉन स्तर को हटाने की जरूरत है। रेडियोधर्मी सामग्री के साथ काम करने वालों को भी काफी खतरा होता है। उन्हें रेडियोधर्मी संदूषण से दूर रखने के लिए सुरक्षात्मक उपायों की आवश्यकता है।

## Papulation Groth and Environmental Quaility

### Introduction

The rapid population growth and economic development in country are degrading the environment through the uncontrolled growth of urbanization and industrialization, expansion and intensification of agriculture, and the destruction of natural habitats. One of the major causes of environmental degradation in India could be attributed to rapid growth of population, which is adversely affecting the natural resources and environment. The growing population and the environmental deterioration face the challenge of sustained development without environmental damage. The existence or the absence of favorable natural resources can facilitate or retard the process of economic development. The three fundamental demographic factors of births, deaths and migration produce changes in population size; composition, distribution and these changes raise a number of important questions of cause and effect. Population Reference Bureau estimated the 6.14 billion world's population in mid 2001. Contribution of India alone to this population was estimated to be 1033 millions. It is estimated that the country’s population will increase to 1.26 billion by the year 2016. The projected population indicates that India will be a first most populous country in the world and China will be second in 2050 (Population Reference Bureau, 2001). The increase of population has been tending towards alarming situation. India is having 18 percent of the world's population on 2.4 percent of its land area has great deal of pressure on its all natural resources. Water shortages, soil exhaustion, deforestation, air and water pollution afflicts many areas. If the world population continues to multiply, the impact on environment could be devastating.

शहरीकरण और औद्योगीकरण के अनियंत्रित विकास, कृषि के विस्तार और गहनता और प्राकृतिक आवासों के विनाश के माध्यम से देश में तेजी से जनसंख्या वृद्धि और आर्थिक विकास पर्यावरण को खराब कर रहा है। भारत में पर्यावरणीय क्षरण के प्रमुख कारणों में से एक जनसंख्या की तीव्र वृद्धि को जिम्मेदार ठहराया जा सकता है, जो प्राकृतिक संसाधनों और पर्यावरण पर प्रतिकूल प्रभाव डाल रहा है। बढ़ती हुई जनसंख्या और पर्यावरण के बिगड़ने से पर्यावरणीय क्षति के बिना सतत विकास की चुनौती का सामना करना पड़ता है। अनुकूल प्राकृतिक संसाधनों की मौजूदगी या अनुपस्थिति आर्थिक विकास की प्रक्रिया को सुगम या मंद कर सकती है। जन्म, मृत्यु और प्रवास के तीन मूलभूत जनसांख्यिकीय कारक जनसंख्या के आकार में परिवर्तन उत्पन्न करते हैं; संरचना, वितरण और ये परिवर्तन कारण और प्रभाव के कई महत्वपूर्ण प्रश्न उठाते हैं। जनसंख्या संदर्भ ब्यूरो ने 2001 के मध्य में विश्व की जनसंख्या 6.14 अरब होने का अनुमान लगाया था। इस जनसंख्या में अकेले भारत का योगदान 1033 मिलियन होने का अनुमान लगाया गया था। यह अनुमान है कि वर्ष 2016 तक देश की जनसंख्या बढ़कर 1.26 बिलियन हो जाएगी। अनुमानित जनसंख्या इंगित करती है कि भारत दुनिया का पहला सबसे अधिक आबादी वाला देश होगा और 2050 में चीन दूसरे स्थान पर होगा (जनसंख्या संदर्भ ब्यूरो, 2001)। जनसंख्या की वृद्धि चिंताजनक स्थिति की ओर प्रवृत्त हुई है। भारत में विश्व की 18 प्रतिशत आबादी है, इसके 2.4 प्रतिशत भू-भाग पर इसके सभी प्राकृतिक संसाधनों पर अत्यधिक दबाव है। पानी की कमी, मिट्टी की थकावट, वनों की कटाई, वायु और जल प्रदूषण कई क्षेत्रों को प्रभावित करता है। यदि विश्व जनसंख्या में वृद्धि जारी रही, तो पर्यावरण पर प्रभाव विनाशकारी हो सकता है।

As the 21st century begins, growing number of people and rising levels of consumption per capita are depleting natural resources and degrading the environment. The poverty-environmental damage nexus in India must be seen in the context of population growth as well. The pressures on the environment intensify every day as the population grows. The rapid increase of human numbers combines with desperate poverty and rising levels of consumption are depleting natural resources on which the livelihood of present and future generations depends. Poverty is amongst the consequences of population

growth and its life style play major role in depleting the environment 3 either its fuel demands for cooking or for earning livelihood for their survival. The unequal distribution of resources and limited opportunities cause push and pull factor for people living below poverty line that in turn overburdened the population density in urban areas and environment get manipulated by manifolds, consequently, urban slums are developed in urban areas.

The growing trends of population and consequent demand for food, energy, and housing have considerably altered land-use practices and severely degraded India's forest vis-à-vis environment also. The growing population put immense pressure on land extensification at cost of forests and grazing lands because the demand of food could not increase substantially to population. Thus, horizontal extension of land has fewer scopes and relies mostly on vertical improvement that is supported by technical development in the field of agriculture i.e. HYV seeds, Fertilizers, Pesticides, Herbicides, and agricultural implements. All these practices causing degradation and depletion of environment with multiplying ratio.

The relationship between population growth, resource depletion and environmental degradation has been a matter of debate for decades. The argument has been between those who view population numbers per se as the main culprit in increasing pressure on the environment and those who place more blame on economic development, non sustainable agricultural and industrial practices, and excessive and wasteful consumption. In fact, both population growth and nonsustainable development are cause for concern in India. Though the relationship is complex, population size and growth tend to expand and accelerate these human impacts on the environment. What is more concern, the number of population rise will increase to such an extent in future that it will cause overall scarcity for resources. Decades of economic expansion and population growth have degraded its land, air and water. The present paper examines the relationship of man to the environment and with growing population, poverty and urbanization the environment is degrading.

**Population growth in India India**

Population growth in India India is the second most populous country in the world after China. Recently, the population of India has crossed the one billion marks. According to the Census of India 2001, the population of 4 India on 1st March 2001 was 1027 millions. At the time of independence, the country's population was 342 million. The number has multiplied three-fold in around five decades. The population growth of India from 1951 to 2001 is presented in Table 1. The total population size of India had grown from 361 million in 1951 to around 1027 million in 2001. The population of India

increased by three times during the period of 1951-2001. The rural population of India has increased around two and half times from 298.7 million to 741.7 million during 1951-2001, whereas the urban population has grown 4.6 fold from 62.4 million in 1951 to 285.3 million in 2001. The decadal growth rates of the population are irregular, as it increased from 13.31 percent in 1951 to 24.8 percent in 1971. It declined to 24.7 percent in 1981, 23.8 percent in 1991 and 21.35 percent in 2001. The rural decadal growth rate of population varies from 8.79 percent in 1951 to 17.97 percent in 2001, whereas the urban decadal growth rate of population varies from 41.43 percent in 1951 to 31.11 percent in 2001.

There are various reasons for this variation in the trend of population growth rate in various censuses. The increase in population has been due to the improvement in health conditions and control of diseases. The density of population has gone up from 117 in 1951 to 312 persons in 2001 and it always shows an increasing trend over the census years in persons per square kilometer. Several push and pull factors are presumed to be operative towards distress out migration from rural to urban areas. This might be due to the declining resource availability per capita and shrinking economic opportunities in rural areas, and better economic opportunities, health and educational facilities etc. in urban areas, providing opportunities for higher level of human capital development could be the underlying factors for rural out migration.

**Environmental challenges**

Population growth and economic development are contributing to many serious environmental problems in India. These include pressure on land, land/soil degradation, forests, habitat destruction and loss of biodiversity, changing consumption pattern, rising demand for energy, air pollution, global warming and climate change and water scarcity and water pollution.

**Pressure on land**

India faces the most acute pressure on agricultural land. Today every million hectares of land supports 7.27 million people. Forty three percent of the land is under cultivation, one of the highest in the world. A change in land utilization pattern implies an increase or decrease in the proportion of area under different land uses at a point in two or more time periods, Over the past fifty years, while India's total population increased by about 3 times, the total area of land under cultivation increased by only 20.27 percent from 118.75 million hectares in 1951 to 142.82 million hectares in 2001. Most of this expansion has taken place at the expense of forest and grazing land. Despite past expansion of the area under cultivation, less agricultural land is available to feed each person in India. It shows variations in land use and a narrow range of fluctuations in the proportion of net sown area to total land in the country since 1951 to 2001. Out of total geographical area of 329 million hectares, only 306 million hectares is the reporting area (the rest being unadministered for various reasons). The land for non-agricultural uses (housing, industry and others) is increased from 9.36 million hectares in 1951 to 22.97 million hectares in 2001. More than 19.4 million hectares are snow bound and

remote leaving only 237 million-hectare for agriculture, forestry, pasture and other biomass production.

**Land/soil degradation**

Direct impacts of agricultural development on the environment arise from farming activities, which contribute to soil erosion, land salination and loss of nutrients. The spread of green revolution has been accompanied by over exploitation of land and water resources and use of fertilizers and pesticides have increased many folds. Shifting cultivation has also been an important cause of land degradation. Leaching from extensive use of pesticides and fertilizers is an important source of contamination of water bodies. Intensive agriculture and irrigation contribute to land degradation particularly salination, alkalization and water logging. It is evident that most of the land in the country is degrading, thus affecting the productive resource base of the economy.

**Forest resources**

With less than 2 percent of the world's total forest area, the country supports 18 percent of its population. The total area under forests was 675.54 thousand square kilometers in 2001, which was 21 percent of the total geographical area, as against the National Forest Policy 1988 stipulation of a target of 33 percent. Even within this recorded area, only 416.81 thousand square kilometers, or only 12.68 percent of country's total land area, comprises dense forest with a crown density of more than 40 percent, thus reflecting a qualitative decline of forests in the country.

The states, which have shown significant decline in the forest covers, were Andhra Pradesh and Madhya Pradesh. Whereas the states of Gujrat, Maharashtra, Rajasthan and West Bengal have shown an increase in forest cover.

Forests are an important natural resource of India. They play an important role in providing raw materials to industries and generating income and 9 employment. Forests also play an important role in enhancing the quality of environment by influencing the ecological balance and life support system (checking soil erosion, maintaining soil fertility, conserving water, regulating water cycles and floods, balancing carbon dioxide and oxygen content in atmosphere etc. They have moderate influence against floods and thus they protect the soil erosion.

**Availability of food**

The per capita net availability of food grains in India indicates that, there is an availability or shortage of food grains in the country. Increasing trends in per capita availability of food grains is largely due to cereals. Although, per capita availability of pulses seems to have gone down since 1961 but the availability of the edible oil, sugar and cotton cloth depict an increasing trend. Overall the per capita availability of food

grains had gone up from 395 grams per capita per day in 1951 to 458 grams per capita per day in 1999-2000. The per capita availability of cereals increased from 334 grams per capita per day in 1951 to 426 grams per capita per day in 1999-2000

**Loss of biodiversity**

Protection of earth's biological diversity is an important goal in its own right. Biodiversity has direct consumptive value in food, agriculture, medicine, industry etc. It also has the aesthetic and recreational value. The greatest threat to biodiversity is not destruction of plants and animals per se, but rather the destruction of their habitat. India is one of the 12 mega-biodiversity countries of the world. From about 70 percent of the total geographical area surveyed so far 46,000 plant species and 81,000 animal species representing about 7 percent of the world's flora and 6.5 percent of the world's fauna have been described. Population growth leads to expanding human settlements and increasing demand for food, fuel and building materials. Modernization of agriculture also threatens potentially valuable local crops. Biodiversity the world over is in peril because the habitats are threatened due to such development programmes as creation of reservoirs, mining, forest clearing, lying of communication and transport networks etc.

**Rising demand for energy**

The environmental effects due to increasing consumption levels of fuels like coal; lignite, oil and nuclear etc. are of growing concern to various researchers. The combustion of these fuels in industries has been a major source of pollution. Coal production through open cast mining; its supply to and consumption in power stations and industrial boilers leads to particulate and gaseous pollution, which can cause pneumoconiosis, bronchitis and respiratory diseases. The energy production/consumption in India during 1950-51 to 2000-2001 is depicted in Table 10. Energy production and consumption has increased steadily in India since 1950 onwards. The production of coal and lignite has increased from 32.2 million tons in 1950-51 to 313.70 million tons in 2000-2001, an increase of 9.74 times. The production of petroleum products registered an increase of 29 times, from 3.3 million tons in 1950-51 to 95.6 million tons in 2000-2001. 12 The bulk of commercial energy comes from the burning of fossil fuels viz. coal and lignite in solid form, petroleum in liquid form and gas in gaseous form. In addition to emission of greenhouse gases, the burning of fossil fuels has led to several ecological problems and associated with health problems like cancer risk, respiratory diseases and other health problems. Burning of traditional fuel adds a large amount of carbon-di-oxide into atmosphere and increases air pollution.

**Air pollution**

Indian cities are among the most polluted in the world. Air in metropolitan cities has become highly polluted and pollutant concentrations exceeds limit considered safe by the World Health Organization (WHO). Suspended particulate levels in Delhi are many

times higher than recommended by the World Health Organization (WHO). The urban air pollution has grown across India in the last decade are alarming. Some of the most important air pollutants are residual suspended particulate matter (RSPM), suspended particulate matter (SPM), nitrogen dioxides (NO2), carbon monoxide (CO), lead, sulfur dioxide (SO2) etc. (Table 11). The main factors accounts to urban air quality deterioration are growing industrialization and increasing vehicular pollution, industrial emissions, automobile exhaust and the burning of fossil fuels kills 13 thousands and lives many more to suffer mainly from respiratory damage, heart and lung diseases. In the countryside, nitrates from animal waste and chemical fertilizers pollute the soil and water, and in the cities, the air is contaminated with lead from vehicle exhaust. In India's largest cities - Mumbai and Delhi - about one-half of children under age 3 show signs of harmful exposure to lead, defined as to or more micrograms of lead per deciliter of blood (IIPS and ORC Macro, 2000)

**Global warming and climate change**

The country's large population and rapidly increasing energy use plays an important and growing role in global warming. Global warming can have major physical, environmental and socioeconomic consequences, which can be both positive and negative. The estimation of these impacts is complex and marked with uncertainties. Climate change would cause changes in 14 precipitation patterns, ocean circulation and marine systems, soil moisture, water availability, and sea level rise. These would make an impact on agriculture, forestry and natural eco-systems like wetlands and fisheries. Also with rising temperatures, and subsequent increasing heat stress and alternation in patterns of vector-borne diseases, the global population would be more vulnerable to health problems, causing disruptions in settlement patterns and large-scale migration. All these would have significant socio-economic consequences (Compendium of environment statistics, 2000).

**Water pollution**

Water use in India has been increased over the past 50 years. Out of the total annual freshwater withdrawals, the largest share goes to agriculture - at 92 percent. Industrial use accounts for another 3 percent and domestic use 5 percent. However, not all the water abstracted is effectively used, there are sizable losses in conveyance and application of irrigated water, a large part of water used by industry and domestic purposes is returned to the streams as effluent waste; and most of the water drawn by power station is used for cooling purposes and is available for reuse. The use of fresh water increased rapidly. The amount of water available per person has declined in recent decades - primarily because of population growth and water scarcity is projected to worsen in the future.

The amount of water available per person has declined in recent decades - primarily because of population growth and water scarcity is projected to worsen in the future.

The water pollution in India comes from three main sources: domestic sewage, industrial effluents and run off from activities such as agriculture. Major industrial sources of pollution in India include the fertilizer plants, refineries, pulp and paper mills, leather tanneries, metal plating and other chemical industries. Levels of solid wastes increased in rivers and lakes and other water systems are also heavily polluted due to the intrusion of solid wastes.

### Summary and Conclusions

The outcomes of high population growth rates are increasing number of people below poverty line, an increasing population density, and pressure on natural resources. The study reveals that the country's population growth and poverty is imposing an increasing burden on the country's limited and continually degrading natural resource base. The natural resources are under increasing strain, even though the majority of people survive at subsistence level. It will 17 increasingly difficult to satisfy the basic needs of a growing population even at present levels of consumption, and the situation will deteriorate progressively as the per capita consumption of resources increases. Population pressure on arable land contributes to the land degradation, thus affecting the productive resource base of the economy. The increasing population numbers and growing affluence have already resulted in rapid growth of energy production and consumption in India and this trend can only be expected to accelerate in the future. The environmental effects like air pollution and global warming are of growing concern owing to increasing consumption levels. The growth of population is a fundamental factor in its relationship to natural resources, environment and technology. To sum up, there is an urgent need to control population and poverty, conserve and protect natural resources and the environment for healthy human beings.

## Carbon footprint

**Carbon footprint**, amount of carbon dioxide ($CO_2$) emissions associated with all the activities of a person or other entity (e.g., building, corporation, country, etc.). It includes direct emissions, such as those that result from fossil-fuel combustion in manufacturing, heating, and transportation, as well as emissions required to produce the electricity associated with goods and services consumed. In addition, the carbon footprint concept also often includes the emissions of other greenhouse gases, such as methane, nitrous oxide, or chlorofluorocarbons (CFCs).

### Concept

A carbon footprint is a measure of the impact our activities have on the environment, and in particular climate change. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating and transportation etc. The 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 and the secondary footprint

**1. The primary footprint** is a measure of our direct emissions of CO2 from the burning of fossil fuels including domestic energy consumption and transportation (e.g. car and plane). We have direct control of these.

**2. The secondary footprint** is a measure of the indirect CO2 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.

**What is a Carbon Footprint Calculator?**

There are carbon footprint calculators available for free all over the Internet. A carbon footprint calculator has you to enter several variables based upon your particular lifestyle - things like: how much your electricity bill is each month; how many miles per week do you drive; how many loads of clothing do you wash per week; the type of vehicle you drive and the like. It takes about 10 minutes to answer all of the questions and then you are presented with your carbon footprint information.

The carbon footprint calculators do not ask any personal information - nothing about identity, income, birth dates or anything like that. The questions are all "carbon based" and aimed solely at determining what you came to find out: how big your carbon footprint is. Carbon footprint calculators are easy and fun to use. Even if the results are not what you want to hear, you will feel really good to know that at least you are doing your part to become aware and begin to make changes to go green and create a sustainable environment for the entire world.

**Why are individual carbon footprints so high?**

**Some Reasons are:**

• We cause huge amounts of air, water and land pollution
• We are incredibly lazy in our home and work habits;
• We produce enormous and completely unjustifiable amounts of waste materials;
• We have been resistant to embrace alternative energy sources;
• We gorge ourselves on animal-based diets that not only destroy our health, but also cause unparalleled amounts of deforestation and shrink our fresh water supplies to nothing.

**The Facts**

• The principal greenhouse gases released as a direct result of human activities are Carbon Dioxide ($CO_2$), Methane ($CH_4$), Nitrous Oxide ($N_2O$), and several types of fluorinated gases.

• These gases are responsible for trapping heat in the atmosphere and causing global warming.

• There has been a 0.9 F (0.5 C) rise in the average sea temperatures over the last four decades.

• Between 1965 and 1995, over 20,000 square kilometers of ice melted in the Arctic

• Over the last 100 years, the global sea levels have risen on average between 10 and 25 cm.

• Surface temperatures worldwide have risen 0.7 C over the past 100 years.

• Average annual Arctic temperatures have risen at twice the rate of the rest of the globe over the past century.

• There is a worldwide trend of glacial retreat.

**HOW TO REDUCE ONE'S CARBON FOOTPRINT**

The obvious ways to negate these devastating problems is to endeavor to lead greener lives. We have to offset our carbon footprints. We have to utilize alternative energy sources - ones that are clean, renewable and environmentally-friendly. Following are some tips that you can initiate within your life immediately:

**Travel light:** Walk or bike instead of driving a car. Cars and trucks run on fossil fuels, which release carbon dioxide into the atmosphere.

**Teleconference instead of flying:** For office meetings, if you can telephone or videoconference, you will save time, money, and carbon emissions. Airplanes pump carbon emissions high into the atmosphere, producing 12 percent of transportation sector emissions.

**See the light:** Use compact fluorescent light bulbs. These energy-efficient bulbs help fight climate change because they reduce the amount of fossil fuels that utilities burn. You will save 100 pounds of carbon for each incandescent bulb that you replace with a compact fluorescent, over the life of the bulb.

**Recycle and use recycled products:** Products made from recycled paper, glass, metal and plastic reduce carbon emissions because they use less energy to manufacture than products made from completely new materials. For instance, you'll save two pounds of carbon for every 20 glass bottles that you recycle. Recycling paper

also saves trees and lets them continue to reduce climate change naturally as they remain in the forest, where they remove carbon from the atmosphere.

**Inflate your tires:** If you own a car, it will get better gas mileage when the tires are fully inflated, so it will burn less gas and emit less carbon. Check your automobile monthly to ensure that the tires are fully inflated. Follow this tip and save 300 pounds of carbon dioxide for every 10,000 miles you drive.

**Plant native trees:** Trees absorb carbon dioxide from the air and use it as their energy source, producing oxygen for us to breathe. A tree in the temperate zone found between the tropics and the polar circles can remove and store 700 to 7,000 pounds of carbon over its lifetime. A tree that shades a house can reduce the energy required to run the air conditioner and save an additional 200 to 2,000 pounds of carbon over its lifetime.

**Turn down the heat:** Heating and air conditioning draw more than half of the energy that a home uses in the United States. Turn down the heat or air conditioning when you leave the house or go to bed. You can easily install a programmable thermostat that can save up money and carbon.

**Buy renewable energy:** Electricity generation produces 40 percent of carbon emissions from the United States. A growing number of utilities generate electricity from renewable energy sources with solar panels, windmills and other technologies. If your utility offers renewable energy, buy it. If not, send them a message asking for clean energy.

**Act globally, eat locally:** If you shop at a supermarket, the food you buy may travel in a plane from the other side of the world, burning fossil fuels the entire trip. Shop at a local farmers markets and you will find fresh and healthy food, and help save our climate.

## Consumerism

Consumerism is a social force to make business more honest and responsible towards consumers. It makes the consumers aware of their rights and also pressurizes the government to adopt the necessary measures to protect consumer interests.

Consumers are often denied their rights in the process of selling. Sellers want consumers as buyers and not as complainants. So, the position of the consumer has been rather weak in relation to the seller. In this regard, consumerism should be regarded as a movement with the involvement of public and the government to protect the rights and interests of the consumers.

Consumerism may be defined as a social movement of consumers seeking redress, restitution and remedy for dissatisfaction that they have accumulated in the purchase of products / service and their performance.

**Advantages**

Advocates of consumerism point to how consumer spending can drive an economy and lead to increased production of goods and services. As a result of higher consumer spending, a rise in GDP can occur. In the United States, signs of healthy consumer demand can be found in consumer confidence indicators, retail sales, and personal consumption expenditures. Business owners, workers in the industry, and owners of raw resources can profit from sales of consumer goods either directly or through downstream buyers.

**Reasons for Consumerism**

The major causes for the evolution of consumerism have been the continuous rise in prices, underperformance of product, quality of the service, Shortage of product and deceptive advertising.

1. **Rising prices**: The value of a rupee was a rupee in 1949 matching its full face value. But now it is worth less than 10 paise. The pricing theory holds that price is directly related to quality and quantity. But prices of mass consumer goods such as soaps, tooth paste etc., are 10% — 20% above the real prices. So, often dealers earn a good margin of profit and create an artificial demand for them.

2. **Adulteration**: Unscrupulous traders indulge in adulteration. They make illegitimate and abnormal profit through adulterated products. Adulteration involves cheap ingredients mixed with the product intended for sale. Such adulterated product is detrimental to health. A survey says about 25 to 35% of the food we eat today is adulterated. Presence of stones in grains, cheaper fats in ghee, mixing of coconut oil with palmoleins etc., are common in adulteration. They all leave behind harmful effects on consumers.

3. **Duplication**: Duplicates are made for all types of products like automobile components, medicines, blades, pens, watches; clothes and even currency notes. Consumers are not able to differentiate the original products from duplicates. Duplicate products are available through wide marketing network undertaken by dishonest traders. Some home made products are stamped "*Made in Japan"*, "*Made in USA*" just to lure the consumers.

4. **Artificial demand**: When the price of a product is steadily increasing, some traders buy in bulk and hoard them. They put up a sign "No stock" in front of their shops, though stocks are in abundance with them. As a result, consumers pay higher prices because of the artificial scarcity created. In certain cinema houses, selling tickets in black is quite

common. Though seats may be vacant, these theaters will be claiming "***full house***". But the sale in '***black***' will be very brisk outside the theater.

5. **Sub-standard products**: Substandard products are made using inferior raw materials or by cutting short the required production processes. After a product is well received in the market, some manufacturers deliberately downgrade the quality of the product without reducing the price. Customers cannot inspect the goods as they are packed and sealed. Only after the use of the goods purchased, they will be in a shock.

6. **Product risks**: Some products are valid or potent only for a particular period. Example: medicines, drugs, fruits, etc. On the expiry of a particular period, consumption of such items proves to be detrimental to health.

7. **Misleading Advertisements**: Misrepresentation of facts, false claims, cheating do occur in advertising. An advertiser may make a tall claim about the usefulness of his product, just to lure the consumers to buy them, whereas the product may not be as useful. So, consumers should be protected against deceptive advertisements.

8. **Warranty and service**: At the time of sale, sellers guarantee a good performance of the product they sell. If a product becomes defective after being sold, buyers are not given any remedy for the defect noticed in the goods. In such cases, remedy is available through consumer redressal forums.

9. **Fitness of products**: Salesmen are supposed to assist the buyers in making wise selection of goods. The products that buyers buy must suit their needs. Product fitness refers to product quality, durability and suitability in relation to the purchase objective of the consumers. But most of the goods are sold by pressurizing the buyers.

10. **Consumer exploitation**:

Consumers are exploited in the following ways:

1. Supply of sub-standard materials
2. Goods that fall short of the actual weight claimed.
3. High prices charged for goods and services.
4. False advertisements.
5. Artificial scarcity to earn abnormal profit.
6. Hoarding and black marketing of goods.
7. Cheating through contests, puzzles, etc.
8. No genuine online sale.
9. Denying free repair or replacement during guarantee period
10. Adulteration of goods.

# Unit 4 (C)

## What is climate?

Before understanding climate change, it is necessary to understand what the climate is. Climate generally refers to the long-term average weather in a given area.Therefore, when the average weather of a particular region changes, it is called Climate Change. Climate change can be felt in any one place and also in the whole world. If we talk in the present context, then its effect is being seen almost all over the world.

- The climate here has changed many times in the entire history of the earth and many incidents of climate change have come to light.
- Scientists studying the Earth show that the temperature of the Earth is constantly increasing. Earth's temperature has risen by 1 degree Fahrenheit over the last 100 years. This change in the temperature of the Earth can be quite small in terms of numbers, but any such change can have a big impact on the human race.
- Some of the effects of climate change can also be felt in the present. Glaciers are melting as the Earth's temperature increases and the water level of the oceans continues to rise, increasing the risk of natural disasters and sinking of some islands as a result.

## Climate change

Climate change describes a change in the average conditions — such as temperature and rainfall — in a region over a long period of time. For example, 20,000 years ago, much of the United States was covered in glaciers. In the United States today, we have a warmer climate and fewer glaciers.

Global climate change refers to the average long-term changes over the entire Earth. These include warming temperatures and changes in precipitation, as well as the effects of Earth’s warming, such as:

- Rising sea levels
- Shrinking mountain glaciers
- Ice melting at a faster rate than usual in Greenland, Antarctica and the Arctic
- Changes in flower and plant blooming times.

Earth’s climate has constantly been changing — even long before humans came into the picture. However, scientists have observed unusual changes recently. For example, Earth’s average temperature has been increasing much more quickly than they would expect over the past 150 years.

**Due to climate change**

**Greenhouse gases:**

- A layer of greenhouse gas remains around the Earth, this layer includes gases such as methane, nitrous oxide, and carbon dioxide.
- This layer of greenhouse gases is essential in maintaining the temperature balance on the Earth's surface and according to analysts; if this layer is not there then the Earth's temperature will drop significantly.
- As human activities are increasing in the modern era, the emission of greenhouse gases is also increasing and due to which the global temperature is increasing.
- **Main greenhouse gases**
    - **Carbon dioxide** - It is considered the most important greenhouse gas and is emitted for both natural and human reasons. According to scientists, the most emissions of carbon dioxide are from burning fossil fuels for energy. Statistics show that there has been a 30 percent increase in the amount of carbon dioxide globally after the industrial revolution.
    - **Methane -** decomposition of biomass is a major source of methane. It is noteworthy that methane is a more effective greenhouse gas than carbon dioxide, but its volume in the atmosphere is less than that of carbon dioxide.
    - **Chlorofluorocarbons -** It is mainly used in refrigerants and air conditioners etc. and has a great adverse effect on the ozone layer.

**Change of land use**

- Deforestation for commercial or personal use is also a major factor in climate change. Trees not only give us fruits and shade, but they also absorb important greenhouse gases like carbon dioxide from the atmosphere. The way trees are being harvested at the present time is quite worrisome, because trees act as natural instruments absorbing carbon dioxide in the atmosphere and with their elimination we will lose that natural machine as well.
- In some countries, such as Brazil and Indonesia, deforestation is the leading cause of emissions of greenhouse gases.

**Urbanization**

- Due to urbanization and industrialization, there has been a lot of change in the way people live their lives. The number of vehicles on the roads around the world has increased significantly. Changes in lifestyle have contributed significantly to the emission of hazardous gases.

## Effects of climate change

### High temperature

Emissions of greenhouse gases from power plants, automobiles, deforestation and other sources are heating the Earth relatively quickly. The global average temperature has been steadily increasing over the last 150 years and the year 2016 is recorded as the hottest year. Increased temperature can also be considered as a reason for the rise in heat related deaths and diseases, rising sea level, increase in storm intensity and many other dangerous consequences of climate change. A research has found that if the issue of greenhouse gas emissions is not taken seriously and efforts are not made to reduce it, then by the end of the century the average temperature of the Earth's surface can increase by 3 to 10 degrees Fahrenheit.

### Change in rainfall pattern

Irregularities of floods, droughts and rains etc. have increased considerably in the last few decades. All this is happening as a result of climate change. In some places there is heavy rainfall, while in some places there is a possibility of drought due to lack of water.

### Sea level rise

Glaciers melt during global warming on a global scale and sea level rises, the effect of which increases the risk of submergence of islands around the sea. People living in small island states like Maldives are already looking for alternative destinations.

### Loss of wildlife species

The rise in temperature and changes in vegetation patterns have forced some bird species to go extinct. According to experts, one-fourth of Earth's species could become extinct by the year 2050. In the year 2008, polar bears were added to the list of animals that could become extinct due to the rise in sea level.

### Prevalence of diseases and economic loss

Experts have predicted that in the future climate change will result in more diseases like malaria and dengue and will be difficult to control. According to World Health Organization (WHO) statistics, over 150,000 people have died due to heat waves since the last decade.

### Forest fire

Long-lasting heat waves due to climate change have created hot and dry conditions suitable for forest fires. According to data from the National Institute for Space Research-INPE, the Brazilian-based National Institute for Space Research, Brazil's

Amazon Forests have faced a total of 74,155 times since January 2019. It has also been revealed that the incidence of fire in the Amazon Forest has increased by 85 percent since the last year (2018).

## Global efforts to tackle climate change

### Intergovernmental Panel on Climate Change (IPCC)

- The Intergovernmental Panel on Climate Change (IPCC) is a United Nations body for conducting scientific assessments related to climate change. Which has 195 member countries.
- It was established in 1988 by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO).
- Its objective is to provide regular scientific assessment of climate change, its impact and future potential risks as well as to strategize policy makers to adapt and mitigate climate change.
- The IPCC assessment provides scientific information to governments at all levels that can be used to develop a liberal policy towards climate.
- The IPCC assessment plays an important role in international negotiations to combat climate change.

### United Nations Climate Change Framework Conference (UNFCCC)

- It is an international agreement aimed at controlling the emission of greenhouse gases into the atmosphere.
- The agreement was reached during the Earth Conference of June 1992. After the signing of this agreement by various countries, it came into force on March 21, 1994.
- Since 1995, annual UNFCCC annual meetings are held. It was under this that the Kyoto Protocol was discussed in 1997 and the target was set by the developed countries to control greenhouse gases. Under the Kyoto Protocol, 40 industrialized countries have been placed on separate list.
- The annual meeting of the UNFCCC is known as the Conference of the Parties (COP).

### Paris Agreement

- The Paris Agreement is an international agreement to deal with climate change, to say the least.
- In 2015, from 30 November to 11 December, representatives of governments of 195 countries discussed a possible new global agreement to deal with climate change in Paris.

- The Paris Agreement of 32 pages and 29 articles, with the goal of reducing greenhouse gas emissions, is recognized as a landmark agreement to curb global warming.

**Climate change and India's efforts**

**National Action Plan on Climate Change (NAPCC)**

- The National Action Plan on Climate Change was launched in the year 2008.
- It aims to make public representatives, various government agencies, scientists, industry and communities aware of the threat posed by climate change and how to counter it.
- **This action plan mainly consists of 8 missions:**
    - National Solar Mission
    - National Mission for Developed Energy Efficiency
    - National Mission on Sustainable Residence
    - National Water Mission
    - National Mission for Sustainable Himalayan Ecosystem
    - National Mission for Green India
    - National Mission for Sustainable Agriculture
    - National Mission on Strategic Knowledge for Climate Change

# What is Global Warming

Global warming is the phenomenon of a gradual increase in the temperature near the earth's surface. This phenomenon has been observed over the past one or two centuries. This change has disturbed the climatic pattern of the earth. However, the concept of global warming is quite controversial but the scientists have provided relevant data in support of the fact that the temperature of the earth is rising constantly.

There are several causes of global warming, which have a negative effect on humans, plants and animals. These causes may be natural or might be the outcome of human activities. In order to curb the issues, it is very important to understand the negative impacts of global warming.

## Definition

“Global warming is a gradual increase in the earth’s temperature generally due to the greenhouse effect caused by increased levels of carbon dioxide, CFCs, and other pollutants. “

## Causes of Global Warming

Following are the major causes of global warming:

## Man-made Causes of Global Warming

### Deforestation

Plants are the main source of oxygen. They take in carbon dioxide and release oxygen thereby maintaining environmental balance. Forests are being depleted for many domestic and commercial purposes. This has led to an environmental imbalance, thereby giving rise to global warming.

### Use of Vehicles

The use of vehicles, even for a very short distance results in various gaseous emissions. Vehicles burn fossil fuels which emit a large amount of carbon dioxide and other toxins into the atmosphere resulting in a temperature increase.

### Chlorofluorocarbon

With the excessive use of air conditioners and refrigerators, humans have been adding CFCs into the environment which affects the atmospheric ozone layer. The ozone layer protects the earth surface from the harmful ultraviolet rays emitted by the sun. The CFCs has led to ozone layer depletion making way for the ultraviolet rays, thereby increasing the temperature of the earth.

### Industrial Development

With the advent of industrialization, the temperature of the earth has been increasing rapidly. The harmful emissions from the factories add to the increasing temperature of the earth.

In 2013, the Intergovernmental Panel for Climate Change reported that the increase in the global temperature between 1880 and 2012 has been 0.9 degrees Celsius. The increase is 1.1 degrees Celsius when compared to the pre-industrial mean temperature.

### Agriculture

Various farming activities produce carbon dioxide and methane gas. These add to the greenhouse gases in the atmosphere and increase the temperature of the earth.

### Overpopulation

Increase in population means more people breathing. This leads to an increase in the level of carbon dioxide, the primary gas causing global warming, in the atmosphere.

## Natural Causes of Global Warming

### Volcanoes

Volcanoes are one of the largest natural contributors to global warming. The ash and smoke emitted during volcanic eruptions goes out into the atmosphere and affects the climate.

### Water Vapour

Water vapour is a kind of greenhouse gas. Due to the increase in the earth's temperature more water gets evaporated from the water bodies and stays in the atmosphere adding to global warming.

### Melting Permafrost

Permafrost is there where glaciers are present. It is a frozen soil that has environmental gases trapped in it for several years. As the permafrost melts, it releases the gases back into the atmosphere increasing the earth's temperature.

### Forest Blazes

Forest blazes or forest fires emit a large amount of carbon-containing smoke. These gases are released into the atmosphere and increase the earth's temperature resulting in global warming.

## Effects of Global Warming

Following are the major effects of global warming:

### Rise in Temperature

Global warming has led to an incredible increase in earth's temperature. Since 1880, the earth's temperature has increased by ~1 degrees. This has resulted in an increase in the melting of glaciers, which have led to an increase in the sea level. This could have devastating effects on coastal regions.

### Threats to the Ecosystem

Global warming has affected the coral reefs that can lead to a loss of plant and animal lives. Increase in global temperatures has made the fragility of coral reefs even worse.

### Climate Change

Global warming has led to a change in climatic conditions. There are droughts at some places and floods at some. This climatic imbalance is the result of global warming.

### Spread of Diseases

Global warming leads to a change in the patterns of heat and humidity. This has led to the movement of mosquitoes that carry and spread diseases.

### High Mortality Rates

Due to an increase in floods, tsunamis and other natural calamities, the average death toll usually increases. Also, such events can bring about the spread of diseases that can hamper human life.

### Loss of Natural Habitat

A global shift in the climate leads to the loss of habitats of several plants and animals. In this case, the animals need to migrate from their natural habitat and many of them even become extinct. This is yet another major impact of global warming on biodiversity.

## How to reduce the effect of Global Warming

### 1. Reduce, Reuse, Recycle

Reduce waste by choosing reusable products instead of disposables. Buy products with minimal packaging. Recycle paper, plastic, newspaper, glass and aluminum cans. By recycling half of your household waste, you can save 1088kg of carbon dioxide every year.

### 2. Use Less Heat and Air Conditioning

Add insulation to your walls and attic, it can lower your heating costs more than 25 percent, by reducing the amount of energy you need to heat and cool your home. Turn down the heat while you're sleeping at night or away during the day, and keep temperatures moderate at all times. Setting your thermostat just 2 degrees lower in winter and higher in summer could save about 907kg of carbon dioxide each year.

**3. Change your lightbulbs**

Replace regular light bulbs with compact fluorescent light (CFL) bulbs. CFLs last 10 times longer than incandescent bulbs, use two-thirds less energy, and give off 70 percent less heat.

**4. Drive less and drive smarter**

Go surfing with friends, Walk and ride your bike more and check out options for carpooling to work or school. When you do drive, make sure your car is running efficiently. For example, keeping your tires properly inflated can improve your petrol mileage by more than 3 percent.

**5. Buy Energy-Efficient Products**

When it's time to buy a new car, choose one that offers good mileage. Home appliances now come in a range of energy-efficient models, and compact florescent bulbs are designed to provide more natural-looking light while using far less energy than standard light bulbs.

Avoid products that come with excess packaging especially molded plastic and other packaging that can't be recycled.

**6. Use Less Hot Water**

Set your water heater at a lower tempreture to save energy and buy low-flow showerheads to save hot water and about 350 pounds of carbon dioxide yearly. Wash your clothes in warm or cold water to reduce your use of hot water and the energy required to produce it.

**7. Use the "Off" Switch**

Save electricity and reduce global warming by turning off lights when you leave a room, and using only as much lights as you need. And remember to turn off your television, video player, stereo and computer when you're not using them. It's also a good idea to turn off the water when you're not using it. While brushing your teeth, shampooing the dog or washing your car, turn off the water until you actually need it for rinsing. You'll reduce your water bill and help to conserve a vital resource.

**8. Plant a Tree or two**

If you have the means to plant a tree, start digging. During photosynthesis, trees and other plants absorb carbon dioxide and give off oxygen. A single tree will absorb approximately one ton of carbon dioxide during its lifetime.

**9. Encourage Others to Conserve**

Share information about recycling and energy conservation with your friends, neighbors and co-workers, and take opportunities to encourage public officials to establish programs and policies that are good for the environment.

# Acid Rain

Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic.

**What Causes Acid Rain?**

This image illustrates the pathway for acid rain in our environment: (1) Emissions of $SO_2$ and $NO_x$ are released into the air, where (2) the pollutants are transformed into acid particles that may be transported long distances. (3) These acid particles then fall to the earth as wet and dry deposition (dust, rain, snow, etc.) and (4) may cause harmful effects on soil, forests, streams, and lakes.

Acid rain results when sulfur dioxide ($SO_2$) and nitrogen oxides ($NO_X$) are emitted into the atmosphere and transported by wind and air currents. The $SO_2$ and $NO_X$ react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.

While a small portion of the $SO_2$ and $NO_X$ that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels. The major sources of $SO_2$ and $NO_X$ in the atmosphere are:

- Burning of fossil fuels to generate electricity. Two thirds of $SO_2$ and one fourth of $NO_X$ in the atmosphere come from electric power generators.
- Vehicles and heavy equipment.
- Manufacturing, oil refineries and other industries.

Winds can blow $SO_2$ and $NO_X$ over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.

## Forms of Acid Deposition

### Wet Deposition

Wet deposition is what we most commonly think of as ***acid rain***. The sulfuric and nitric acids formed in the atmosphere fall to the ground mixed with rain, snow, fog, or hail.

### Dry Deposition

Acidic particles and gases can also deposit from the atmosphere in the absence of moisture as ***dry deposition***. The acidic particles and gases may deposit to surfaces (water bodies, vegetation, buildings) quickly or may react during atmospheric transport to form larger particles that can be harmful to human health. When the accumulated acids are washed off a surface by the next rain, this acidic water flows over and through the ground, and can harm plants and wildlife, such as insects and fish.

## The Effects of Acid Rain

### Effects of Acid Rain on Fish and Wildlife

The ecological effects of acid rain are most clearly seen in aquatic environments, such as streams, lakes, and marshes where it can be harmful to fish and other wildlife. As it flows through the soil, acidic rain water can leach aluminum from soil clay particles and then flow into streams and lakes. The more acid that is introduced to the ecosystem, the more aluminum is released.

Some types of plants and animals are able to tolerate acidic waters and moderate amounts of aluminum. Others, however, are acid-sensitive and will be lost as the pH declines. Generally, the young of most species are more sensitive to environmental conditions than adults. At pH 5, most fish eggs cannot hatch. At lower pH levels, some adult fish die. Some acidic lakes have no fish. Even if a species of fish or animal can tolerate moderately acidic water, the animals or plants it eats might not. For example, frogs have a critical pH around 4, but the mayflies they eat are more sensitive and may not survive pH below 5.5.

### Effects of Acid Rain on Plants and Trees

Dead or dying trees are a common sight in areas effected by acid rain. Acid rain leaches aluminum from the soil. That aluminum may be harmful to plants as well as animals. Acid rain also removes minerals and nutrients from the soil that trees need to grow.

At high elevations, acidic fog and clouds might strip nutrients from trees' foliage, leaving them with brown or dead leaves and needles. The trees are then less able to absorb sunlight, which makes them weak and less able to withstand freezing temperatures.

### Effects of Acid Rain on Materials

Not all acidic deposition is ***wet***. Sometimes dust particles can become acidic as well, and this is called ***dry deposition***. When acid rain and dry acidic particles fall to earth, the nitric and sulfuric acid that make the particles acidic can land on statues, buildings, and other manmade structures, and damage their surfaces. The acidic particles corrode metal and cause paint and stone to deteriorate more quickly. They also dirty the surfaces of buildings and other structures such as monuments.

The consequences of this damage can be costly:

- damaged materials that need to be repaired or replaced,
- increased maintenance costs, and
- Loss of detail on stone and metal statues, monuments and tombstones.

### Effects of Acid Rain on Visibility

In the atmosphere, $SO_2$ and $NO_X$ gases can be transformed into sulfate and nitrate particles, while some $NO_X$ can also react with other pollutants to form ozone. These particles and ozone make the air hazy and difficult to see through. This affects our enjoyment of national parks that we visit for the scenic view such as Shenandoah and the Great Smoky Mountains.

### Effects of Acid Rain on Human Health

Walking in acid rain, or even swimming in a lake affected by acid rain, is no more dangerous to humans than walking in normal rain or swimming in non-acidic lakes. However, when the pollutants that cause acid rain —$SO_2$ and $NO_X$, as well as sulfate and nitrate particles— are in the air, they can be harmful to humans.

$SO_2$ and $NO_X$ react in the atmosphere to form fine sulfate and nitrate particles that people can inhale into their lungs. Many scientific studies have shown a relationship between these particles and effects on heart function, such as heart attacks resulting in death for people with increased heart disease risk, and effects on lung function, such as breathing difficulties for people with asthma.

## Acid Rain

Acid rain is a result of air pollution. When any type of fuel is burnt, lots of different chemicals are produced. The smoke that comes from a fire or the fumes that come out of a car exhaust don't just contain the sooty grey particles that you can see - they also contains lots of invisible gases that can be even more harmful to our environment.

Power stations, factories and cars all burn fuels and therefore they all produce polluting gases. Some of these gases (especially nitrogen oxides and sulphur dioxide) react with the tiny droplets of water in clouds to form sulphuric and nitric acids. The rain from these clouds then falls as very weak acid - which is why it is known as "acid rain".

**The Effects of Acid Rain**

Acid rain can be carried great distances in the atmosphere, not just between countries but also from continent to continent. The acid can also take the form of snow, mists and dry dusts. The rain sometimes falls many miles from the source of pollution but wherever it falls it can have a serious effect on soil, trees, buildings and water.

Forests all over the world are dying, fish are dying. In Scandinavia there are dead lakes, which are crystal clear and contain no living creatures or plant life. Many of Britain's freshwater fish are threatened, there have been reports of deformed fish being hatched. This leads to fish-eating birds and animals being affected also. Is acid rain responsible for all this? Scientists have been doing a lot of research into how acid rain affects the environment.

Forests

It is thought that acid rain can cause trees to grow more slowly or even to die but scientists have found that it is not the only cause. The same amount of acid rain seems to have more effect in some areas than it does in others.

As acid rain falls on a forest it trickles through the leaves of the trees and runs down into the soil below. Some of it finds its way into streams and then on into rivers and lakes. Some types of soil can help to neutralise the acid - they have what is called a "buffering capacity".

Other soils are already slightly acidic and these are particularly susceptible to the effects of acid rain.

Acid rain can effect trees in several different ways, it may:

• dissolve and wash away the nutrients and minerals in the soil which help the trees to grow.

• cause the release of harmful substances such as aluminium into the soil.

• wear away the waxy protective coating of leaves, damaging them and preventing them from being able to photosynthesise properly.

A combination of these effects weakens the trees which means that they can be more easily attacked by diseases and insects or injured by bad

weather. It is not just trees that are affected by acid rain, other plants may also suffer.

## Lakes and Rivers

It is in aquatic habitats that the effects of acid rain are most obvious. Acid rain runs off the land and ends up in streams, lakes and marshes - the rain also falls directly on these areas.

As the acidity of a lake increases, the water becomes clearer and the numbers of fish and other water animals decline. Some species of plant and animal are better able to survive in acidic water than others. Freshwater shrimps, snails, mussels are the most quickly affected by acidification followed by fish such as minnows, salmon and roach. The roe and fry (eggs and young) of the fish are the worst affected, the acidity of the water can cause deformity in young fish and can prevent eggs from hatching properly.

The acidity of the water does not just affect species directly, it also causes toxic substances like aluminium to be released into the water from the soil, harming fish and other aquatic animals.

Lakes, rivers and marshes each have their own fragile ecosystem with many different species of plants and animals all depending on one another to survive. If a species of fish disappears, the animals which feed on it will gradually disappear too. If the extinct fish used to feed on a particular species of large insect, that insect population will start to grow, this in turn will affect the smaller insects or plankton on which the larger insect feeds.

## Buildings

Every type of material will become eroded sooner or later by the effects of the climate. Water, wind, ice and snow all help in the erosion process but unfortunately, acid rain can help to make this natural process even quicker. Statues, buildings, vehicles, pipes and cables can all suffer. The worst affected are things made from limestone or sandstone as these types of rock are particularly susceptible and can be affected by air pollution in gaseous form as well as by acid rain.

## Where is it coming from?

Until relatively recently air pollution has been seen as a local issue. It was in southern Scandinavia in the late 1950's that the problems of acid rain were first observed and it was then that people began to realise that the origins of this pollution were far away in Britain and Northern Europe. One early answer to industrial air pollution was to build very tall chimneys. Unfortunately all this does is push the polluting gases up into the clouds allowing emissions to float away on the wind. The wind carries the pollution many hundreds of miles away where it eventually falls as acid rain. In this way Britain has contributed at least 16% of the acid deposition in Norway. Over ninety percent of Norway's acid pollution comes from other countries. The worst European polluters are Germany, UK, Poland and Spain, each of them

producing over a million tons of sulphur emissions in 1994. Governments are now beginning to admit that acid rain is a serious environmental problem and many countries are now taking steps to reduce the amount of sulphur and nitrogen emissions.

What can be done?

Reduce emissions:

• Burning fossil fuels is still one of the cheapest ways to produce electricity so people are now researching new ways to burn fuel which don't produce so much pollution.

• Governments need to spend more money on pollution control even if it does mean an increase in the price of electricity.

• Sulphur can also be 'washed' out of smoke by spraying a mixture of water and powdered limestone into the smokestack.

• Cars are now fitted with catalytic converters which remove three dangerous chemicals from exhaust gases.

Find alternative sources of energy

• Governments need to invest in researching different ways to produce energy.

• Two other sources that are currently used are hydroelectric and nuclear power. These are 'clean' as far as acid rain goes but what other impact do they have on our environment?

• Other sources could be solar energy or windmills but how reliable would these be in places where it is not very windy or sunny?

• All energy sources have different benefits and costs and all theses have to be weighed up before any government decides which of them it is going to use.

Conserving Resources

• Greater subsidies of public transport by the government to encourage people to use public transport rather than always travelling by car.

• Every individual can make an effort to save energy by switching off lights when they are not being used and using energy-saving appliances - when less electricity is being used, pollution from power plants decreases.

• Walking, cycling and sharing cars all reduce the pollution from vehicles

Restoring the Damage done by Acid Rain

Lakes and rivers can have powdered limestone added to them to neutralise the water - this is called "liming". Liming, however, is expensive and its effects are only temporary - it needs to be continued until the acid rain stops. The people of Norway and Sweden have successfully used liming to help restore lakes and streams in their countries. A major liming programme is currently taking place in Wales.