
UNIT 6 ENVIRONMENT AND HEALTH*

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Learning Objectives

After having read this Unit, you will be able to:

- Know about the relationship between environment and health
- Explain the concept and types of stress
- Discuss about environmental health
- Identify the factors contributing to environmental health, and
- Familiarize yourself with relationship between environment, climatic changes and human health.

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6.0 INTRODUCTION

The link between protecting the natural environment and safeguarding human health cannot be denied. Both researchers and legislators have focussed their attention on identifying and regulating the various environmental toxins to minimise harmful exposure. The central problem in environmental health is the adverse effect of various harmful exposures to agents such as toxic chemicals, air pollutants, and natural disasters on the human health. However, developing a healthy sustainable environment extends beyond controlling these environmental hazards. We need to first understand the way human health is attached to the environmental agents to properly design and implement interventions that will lead us to an ideal biosphere. This Unit will discuss the relationship with environment and health, stress and sources of stress. The Unit will also introduce you to the factors contributing to environmental health and lastly talk about the relationship between environment and climate changes.

6.1 ENVIRONMENT AND HEALTH

What is health?

The World health organization's (WHO) definition of health is "a state of complete physical, mental, and social well-being and not merely the absence the disease and infirmity." According to the American Public Health Association, "environmental health is a subset of public health that focuses on people's interactions with their surroundings, improves human health and well-being, and builds healthy and secure communities. Any complete public health system must include environmental health. The field strives to improve policies and programmes that safeguard people and provide communities with healthier surroundings by reducing chemical and other environmental exposures in air, water, soil, and food."

People's exposure to dangerous contaminants in the air, water, soil, food, and materials in their homes and workplaces is the focus of environmental health. Pollutants in the environment can cause health problems such as respiratory disorders, heart disease, and certain types of cancer.

Clean air, water, plants, and food supplies are essential for our health and well-being. Therefore, just as our actions and choices affect the environment, the health of the planet influences our health and well-being as well as our communities, families, and economies. The five benefits of a healthy environment are listed below:

1. Infection-free life
2. Increased self-confidence
3. Higher productivity
4. Sense of propriety
5. Lower chance of being stressed

It is critical to keep the surroundings clean in order to maintain one's health. Many disease-causing microorganisms, such as those that cause diarrhoea, typhoid, and worm infection, can be found in filthy settings. This means that maintaining good personal hygiene and keeping the surroundings clean can help to prevent numerous

diseases. According to global surveys, collaborating with employers and employees to make the workplace a safer and healthier environment can lower absenteeism, reduce the incidence of accidents and illnesses, and save organisational costs.

Our health and well-being can be influenced by the environment both directly and indirectly. Environmental health is the study of how the environment affects one's health. Environmental health refers to characteristics of human health, such as quality of life, that are influenced by environmental factors such as physical, chemical, biological, social, and psychological influences. Everything outside of us, including the physical, ecological, social, and behavioural surroundings, is referred to as the environment. Health is more than just the absence of sickness or illness; it is a condition of complete physical, mental, and social well-being.

For good health, we require safe, healthy, and supportive environments; our living environment is a fundamental determinant of our health and well-being. We rely on the environment for energy and the things we need to exist, such as clean air, safe drinking water, healthy food, and secure living spaces. Many features of our environment, both natural and constructed, can have an impact on our health. Hence, it is critical that we understand health issues in the context of the larger environment in which we live.

Many factors in the environment can have an impact on our health. Cancer, heart disease, and asthma are among diseases that can be exacerbated by environmental factors. Exposure to various forms of pollution, contaminated water, insect bites, UV rays, smoke exposure, hazardous substance, lead, noise, asbestos can have major serious impact on one's health and well-being. Table 6.1 illustrates how several features of the environment might have an impact on our health. Figure 6.1 illustrates the key determinants of one's health and well-being in the neighbourhood.

Table 6.1 Environmental exposures and related human health effects

Environmental exposure	Examples of health effects
Outdoor Air pollution	Respiratory conditions, cardiovascular disease, lung cancer
Unsafe drinking water	Diarrhoeal (gastrointestinal) illnesses
Contaminated recreational water	Diarrhoeal (gastrointestinal) illnesses; eye, ear, nose, and throat infections
Mosquitoes, ticks, and other vectors	Malaria, dengue fever, Rickettsial disease
UV (ultraviolet) exposure	Too much: melanoma, non-melanoma skin cancer, eye cataracts Too little: vitamin D deficiency, leading to rickets, osteoporosis, and osteomalacia
Second-hand smoke exposure	In infants: low birthweight, sudden unexpected death in infancy (SUDI) In children: asthma, lower respiratory infections, middle ear infections In adults: ischaemic heart disease, stroke, lung cancer
Household crowding	Infectious diseases, including lower respiratory infections

Cold and damp housing	Excess mortality
Climate change	Infectious diseases, including giardiasis, cryptosporidiosis, and salmonellosis; heat stroke
Hazardous substances	Poisoning, burns, dermatitis
Lead	In children: developmental delays, behavioural problems In adults: increased blood pressure
Asbestos	Breathing difficulties, lung cancer, mesothelioma
Noise	Hearing loss, cardiovascular problems, insomnia, psychophysiological problems

Source: <https://www.ehinz.ac.nz/indicators/overview/what-is-environmental-health/>

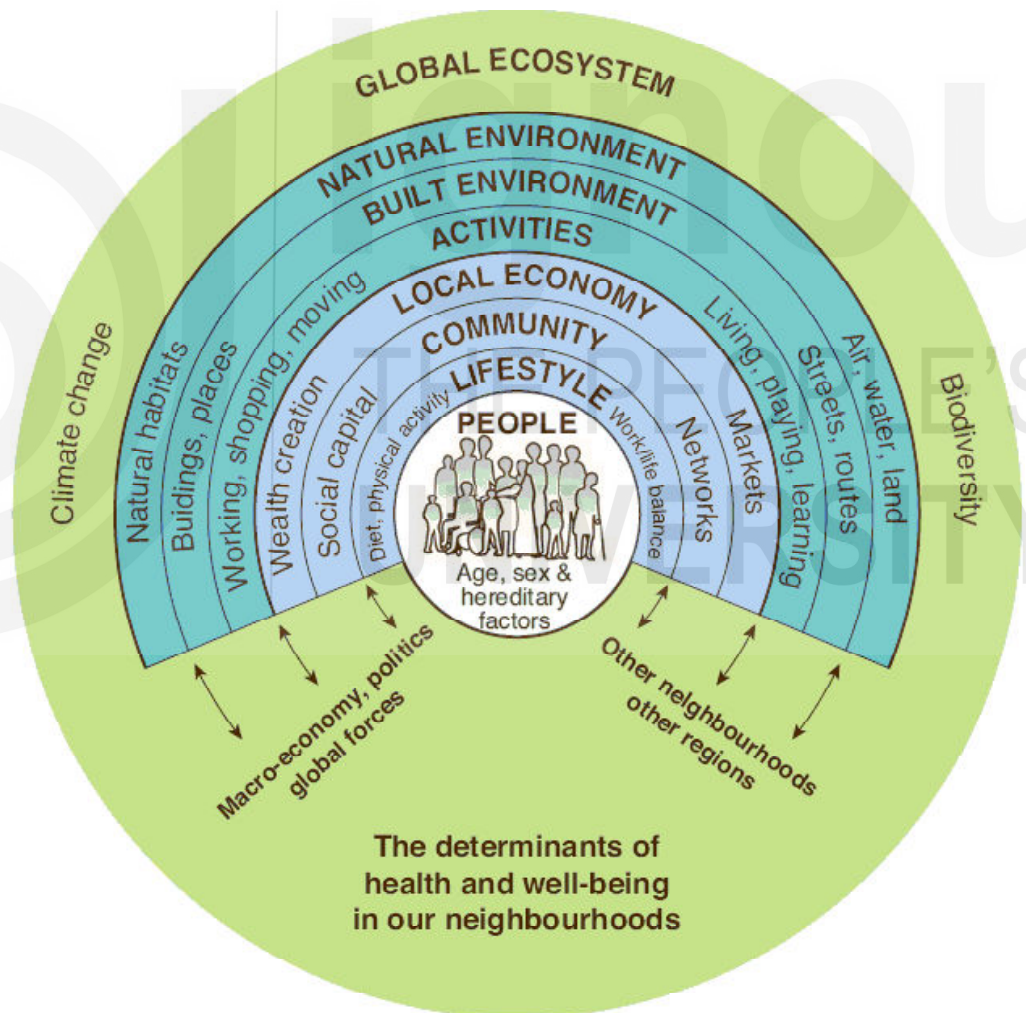


Figure 6.1 Determinants of health and well-being in our neighbourhoods

Source: Adopted from Barton and Grant (2006)

6.2 CONCEPTS AND TYPES OF STRESS

Human-environment interactions take a variety of forms, resulting in a variety of results. These exchanges have mostly good effects, given the human species' ability to thrive.

Successful adjustments to environmental difficulties and demands, on the other hand, are not free. Sub-optimal environmental conditions place demands on individuals that may be beyond their capacities. Stress is the result of an imbalance between environmental demands and human response capabilities (Evans and Cohen, 2004). Stress has been linked to ill-health through immune system changes (Sagerstrom and Miller, 2004), increased cardio-vascular responses (Streptoe and Kivimaki, 2013), and inflammatory responses (Sagerstrom and Miller, 2004). Stress has been connected to a variety of psychological issues, including poor mental health (Staufenwiel et al 2013). However, not all stressors are created equal, and not all stressors' impacts are deleterious to both bodily and psychological well-being (Steg and Groot, 2019).

Types of Stress

Stress is something that everyone experiences at some point in their lives. When the term 'stress' comes into a conversation, people usually associate a negative connotation to it but not all stress is bad. In fact, there are various types of stress and there is a type of stress which is called *eustress*, it is a good type of stress that is positive in nature. All stress is not really bad for us but we usually associate stress with a negative connotation it but there is also a positive stress that is good for humans. Dr. Michael Genovese, a clinical psychiatrist, says people rarely think of stress as a good thing, yet eustress is exactly that - good stress. He adds that "exciting or stressful experiences induce a biological response in the body." Nerves can cause eustress, which can be triggered when confronted with a pleasurable task. This is vital, according to Genovese, because our well-being can suffer if we donot have enough eustress. Eustress keeps us motivated, helps us achieve our goals, and makes us feel good about ourselves.

Eustress can be defined as a positive type of stress that has beneficial effects on one's motivation, performance, health, and emotional well-being. Distress, on the other hand, can be referred to as the opposite of eustress and makes one feel overwhelmed physically, mentally, and emotionally and can often lead to depression, anxiety, and other types of physical and mental illnesses. Distress and eustress are on the opposite ends of the spectrum. Distress, unlike eustress, can make you feel helpless since your resources (physically, cognitively, and emotionally) are insufficient to satisfy the demands. It is negative stress that can cause anxiety, despair, and a drop in performance.

According to Hans Selye, eustress actually has emotional and physical health benefits. Mills, Reiss, and Dombeck (2018) have listed the following ways in which eustress varies from distress:

- It energises and inspires us
- It is viewed as something under our control
- It feels exciting
- It improves focus and performance

Distress, or negative stress, on the other hand, is marked by the following characteristics:

- It lasts for both short and long periods of time
- It causes anxiety and concern
- It exceeds our coping abilities
- It causes unpleasant feelings

- It reduces focus and performance
- It contributes to mental and physical problems

Acute Stress

Everyone experiences acute stress. It is the body's first response to a new and difficult environment. For instance, the kind of anxiety one may experience after narrowly avoiding a vehicle accident. Acute stress might sometimes arise from doing something you enjoy. On a roller coaster or while skiing down a steep mountain slope, it is somewhat terrifying, yet thrilling sensation. Normally, these occurrences of acute stress do not cause you any harm. They might even be beneficial to your health. Stressful experiences teach your body and brain how to respond in the most effective way to future stressful situations.

The physiological systems should return to normal once the danger has passed. However, in the case of severe acute stress, post-traumatic stress disorder (PTSD) and other mental health issues can result from this type of stress, such as when the person has been in a life-threatening situation.

Episodic Acute Stress

When you have frequent periods of acute stress, it is known as episodic acute stress. This may occur if you are frequently apprehensive and concerned about events that you believe may occur. You may feel as though your life is in disarray and that you are going from one catastrophe to the next. Certain occupations, such as law enforcement or firefighting, may also expose you to high-stress circumstances on a regular basis. Episodic acute stress, like severe acute stress, can have a negative impact on your physical and mental health.



Chronic Stress

Chronic stress occurs when you experience elevated stress levels over an extended period of time. This type of long-term stress might be harmful to your health. It could contribute to the following concerns:

- cardiovascular disease and anxiety
- depression
- blood pressure that is too high

Source: <http://www.istockphoto.com/illustrations/deflated-balloon> a compromised immune system

Chronic stress can also lead to common symptoms including headaches, stomach trouble, and sleep problems and various other physical and mental health related concerns.

Check Your Progress 1

1. What is the definition of health according to the WHO?

.....

2. Mention the five major benefits of a healthy environment.

.....

3. Which type of stress is attributed as a good type of stress?

.....

6.3 STRESS MANAGEMENT

Stress is a part of being alive in this world. It can be helpful in motivating and pushing to achieve goals. Various types of stress have been discussed in the previous section. Stress management is extremely important because undergoing stress is inevitable and we all experience stress in our lives at some point or the other. Since stress can have various physical and psychological manifestations, it is crucial for us to learn effective ways to cope and manage with the stress. There are various ways one can learn to manage and cope with their stress and some of the major techniques and tips are listed below:

- Understanding one’s stress
- Identification of the source of stress
- Using quick stress relieving activities like deep breathing exercises
- Exercising regularly
- Developing a support system that you can reach out to in stressful times for support, comfort, and care
- Meditation
- Practicing self-care
- Time management
- Take care of your physical health
- Communicate what you are going through to someone
- Take quality sleep
- Take breaks from work to rejuvenate
- Establish and maintain your boundaries
- Practice mindfulness

One can also opt to consult a counselling psychologist or psychotherapist and take therapeutic intervention for better management and coping with the stress in their life. Stress also impacts one's sleep and other aspects of health and one can also seek help from a healthcare provider for any pharmacological intervention that might help them better in dealing with whatever they are going through. Psychotherapy and pharmacological interventions often go hand in hand so that the person can feel better in a holistic sense.

6.4 CONCEPTUALIZATION OF STRESS

Stress research owes much of the early works of Cannon (1932) and Hans Selye (1956). Cannon studied animals and human reactions in dangerous situations. He noted that animals and humans displayed adaptive 'flight' or 'fight' responses when they were confronted with emergencies. He also said that these fight or flight responses involve the activation of the sympathetic-adrenal medullary system. On one hand, Cannon was concerned with the response to acute threat, Selye, on the other hand was more interested in the adaptation of the body to chronic challenges.

General Adaptation Syndrome Hans Selye proposed a three-stage pattern of response to stress which he called the General Adaptation Syndrome (GAS). Selye described the physiological changes that happen in the human bodies automatically as a response to stress. It was first developed by Selye in 1936 and it is considered to be one of the pioneering models of stress that gave a rather biological formulation to the concept of stress.

The three phases of GAS go through an alarm stage analogous to Cannon's flight or fight response, a resistance stage in which the body tries to cope with or adapt with the new demands, and an exhaustion stage during which bodily resources become depleted and system damage may occur.



Alarm Stage This is the body's initial response to the stress that has come up, and it is also referred to as the fight or flight response stage. During this period, the sympathetic nervous system of the body gets alert and starts releasing hormones automatically and release adrenaline and noradrenaline which increases the heart rate, blood pressure, breathing, etc. It also dilates the pupils, flushes the skin and increase the senses.

Resistance Stage When the body attempts to revive itself after the shock from the stress is referred to as the resistance stage. If the stressor is no longer there, a person can cope with the stress and the body will return to the homeostatic levels before the stress occurred. In case, the stressful situation is not gone and continues for a longer duration, the body will not know when to return to the normal functioning and continue to secrete hormones and stays alert. Prolonged levels of higher levels of stress cause various types of issues in the body. For example, it affects the following:

- Bowel movements
- Headaches
- Mood

- Concentration
- Sleep

When the stress still does not get resolved, the body goes to the third stage, i.e., Exhaustion stage

Exhaustion Stage It is known to be the last stage in the GAS model of stress. Chronic stress often leads to feelings of being drained physically, mentally, and emotionally to the point that the body of the person is no longer able to manage and cope with the stress that has been affecting it for such a long time.

The signs of the exhaustion stage are burnout, decreased tolerance of stress, and fatigue. Prolonged high levels of stress can also contribute to anxiety related issues, cardiovascular problems, digestion problems, mental health related disorders, depression, etc.

Psychological Models of Stress

Psychological models of stress have developed independently from biological models and have focused on the influence of psychological factors on stress responses. By far best known of these models is the transactional model (Lazarus and Folkman, 1987).

Transactional Model of Stress According to this model, stress is the product of the interaction between a person and the environment. Stress arises not only from the occurrence of an event but also from people's cognitive appraisal of the event, thus the coping strategies, they used to deal with the event, both of which also influence the stress levels. More recently allostatic theory (Mcewen, 1998) has proposed a dynamic view of stress as a continuous effort of the body to achieve allostasis or stability to change. According to this theory, there is not one ideal state of bodily functioning. Every time a person is confronted with stressors, physiological stress systems are activated to find a new equilibrium that allows the individual to function in the changed situation (Steg and Groot, 2019).

6.5 ENVIRONMENTAL STRESSORS

Stressors are specific kinds of stimuli that place demands on the individual and poses a threat to the well-being. Stressors can be physical or psychological and their characteristics depends on the intensity or severity, duration, predictability, controllability and chronicity. Environmental stressors are things or events in our surroundings that cause stress, such as distractive weather events, pollution, noise, crowding, and work. Let us now examine some environmental stressors that influence the well-being of the individual.

6.5.1 Pollution

Environmental pollution is not a new issue, but it is still the world's most serious problem and one of the leading causes of sickness and mortality in the environment. Urbanization, industrialisation, mining, and exploration by humans are at the forefront of worldwide environmental contamination. Environmental contamination is a threat to both developed and developing countries. Environmental pollution, according to Holdgate (1979), is defined as the introduction of a chemical or energy into the environment by humans that is likely to interfere with the environment's rightful usage. Singh (1991) defined

pollution as a “disequilibrium situation from equilibrium” in any system. This concept can be used to describe all sorts of pollution, including physical, economic, political, social, and religious contamination. Various sources of pollution have been recognised throughout the last few decades, that are altering the makeup of the environment’s water, air, and soil.

Pollutants are substances that pollute the environment. A pollutant is any chemical (toxic material), radionucleotides, organophosphorus compounds, gases, or geochemical substances (dust, sediments), biological organisms or products, or physical substances (heat, radiation, sound waves) that is released intentionally or inadvertently into the environment with actual or potential adverse, harmful, unpleasant, inconvenient effects by man. Such negative consequences may be direct or indirect, mediated by resources, organisms, or climate change. Pollution can be classified into the following categories based on the nature of the pollutants and the subsequent environmental components:

1. Air pollution
2. Water pollution
3. Soil or land pollution
4. Noise pollution
5. Radioactive pollution
6. Thermal pollution

Among these pollutions, air pollution is one of the main types of pollution threatening the environment, humans, plants, animals, and all living organisms.

6.5.2 Air

Toxic or hazardous air pollutants are suspected for causing cancer, birth defects, or other serious harms. They can be gases like hydrogen chloride, benzene or toluene dioxin, or compounds like asbestos or elements such as Cadmium, Mercury, and Chromium.

Health effects from toxic air pollutants Toxic air pollutants pose different risks to health depending upon the specific pollutants,

- Cancer in lungs, kidneys, stomach, etc.
- Harm to the nervous system and brain
- Birth defects
- Irritation to the eyes, nose, and throat
- Coughing and wheezing
- Impaired lung function
- Harm to the cardiovascular system
- Reduced fertility

Many of these air contaminants are inhaled by people in their daily lives. Pollutants settle in water bodies such as streams, rivers, and lakes. People might consume them

by drinking the water or eating the fish caught in these waters. Some harmful contaminants settle in the mud that children play in and may ingest. Emissions from charcoal-fired power plants, industries, refineries, as well as autos, trucks, and buses, are all major sources of harmful air pollution outside. Tobacco, smoking, asbestos-containing building materials, and chemicals such as solvents, all contribute to indoor air pollution.

6.5.3 Noise

It is defined as unwanted sounds and is typically characterized by high intensity as measured by decibels, frequency, pitch, periodicity. Sound is necessary but not sufficient to produce noise. The psychological components of sound that is unwanted and physical components, i.e., its intensity play a central role in perceiving noise. Other important psychological characteristics of sound include its predictability, and degree of personal control over the source of sound (Evans and Cohen, 1987).

Chronic noise produces physiological stress and can also result in significant increase in blood pressure. Adults and children can have cardiovascular problems as well as other uneasiness in as an effect of noise pollution. Children attending schools near airports have higher noradrenaline and other stress hormones as compared to children living in quieter places. Additional evidence from physiological stress and noise comes from work sites: people working in noisier locations particularly for many years have higher blood pressures. Chronic noise negatively impacts psychologically also. It affects performance, and may alter the ability to allocate attention, interfering the directions of infrequent signals, and damaging memory. Noise also affects motivation. Children in noisier classrooms have been reported to have lesser achievement motivations compared to children from quieter classrooms (Shield & Dockrrel, 2003).

6.5.4 Water

Toxic water and chemical waste materials are capable of causing death or injury to life. Water is considered toxic if its poisonous, radioactive, explosive, carcinogenic causing cancer, mutagenic causing damage to chromosomes, or teratogenic causing birth defects or bio-accumulative, i.e., increasing the concentration at the higher end of the food chain. Waste containing dangerous pathogens such as used syringes is sometimes considered to be toxic for water. Poisoning occurs when toxic waste is ingested, inhaled, or absorbed by the skin. Toxic water results from industrial, chemical, and biological processes. Toxins are found in households, offices, and commercial wastes. Toxicity in industrial and electronic waste includes pesticides, effluents, batteries from electronic devices, cellphones and computers. Gallons of ground water is contaminated with uranium and other toxic chemicals and radioactive wastes derived from nuclear fuels etc. Industrial and electronic wastes also trigger water pollution and increases the environmental hazards to the people.

Toxic water products are divided into three general categories—chemical wastes, radioactive wastes, and bio-medical wastes. Chemical wastes are substances that are considered corrosive and flammable. They react when interacting with other elements to create toxic by-products. Lead and mercury are placed in this category. Radioactive wastes, that produce or absorb ionizing radiation and main material, interact with elements and compounds such as rods and water that moderate nuclear reactions. Bio-medical wastes are a broad category including body tissues and fluids, capable of harbouring infectious disease.

6.5.5 Chemicals

Chemical waste items have the potential to kill or injure people. Poisonous, radioactive, explosive, carcinogenic, mutagenic, teratogenic, or bio-accumulative waste is deemed toxic. Toxic waste is defined as waste that contains deadly pathogens, such as discarded syringes. When poisonous waste is swallowed, breathed, or absorbed via the skin, poisoning ensues. Toxic waste can come from a variety of sources, including physical, chemical, and biological. Toxics can be found in offices, homes, and business garbage. Batteries for electrical gadgets, insecticides, cell phones, and computers are examples of common products that would subsequently become part of the toxic waste streams of industrialised countries. Throughout the ecosystems, toxic wastes have wreaked havoc on animal and plant populations. These wastes disrupt natural repair processes, harm ecosystems, and severely limit or prevent endangered species reproduction.

Check Your Progress 2

1. What are major characteristics of distress or negative stress?
.....

2. Briefly mention the major types of pollution.
.....

3. What are the general categories of toxic water products?
.....

6.6 DEFINITION AND DESCRIPTION OF ENVIRONMENTAL HEALTH

WHO's definition of environmental health comprises of those aspects of human health that includes quality of life, that are determined by physical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that can potentially affect adversely the health of the present and future generations.

Some of the areas contributing to Environmental Health

1. *Environmental Epidemiology* A branch of epidemiology that explores how human health is affected by exposure to the environment. This discipline investigates how a variety of external risk factors can either cause or prevent disease, illness, injury, developmental abnormalities, and mortality. It investigates the link between exposure to environmental health agents and illness development.
2. *Environmental Toxicology* Exposure and illness development are linked by a causal mechanism. Toxicological tests aid in chemical risk assessment, which is a quantitative estimate of the potential consequences of various types of chemical exposures on human health and the environment (for example, pesticide residues in food, pollutants in water). As a result, given our society's reliance on chemicals and the diversity of chemicals found in the environment, it is vital to assess the potential for negative consequences, with toxicology becoming an increasingly important part of decision-making processes.

Environmental toxicology is a sub-discipline that is growing in importance as a result of the human and environmental repercussions of globalisation and industrialisation. The examination of chemical fate and repercussions in the environment is how it is described. Environmental toxicology is most frequently associated with the study of anthropogenic-derived environmental chemicals, while also encompasses harmful substances naturally found in the environment (such as microbial and plant poisons, as well as animal venom).

3. *Environmental Engineering* A professional engineering discipline that brings together broad scientific disciplines such as chemistry, biology, ecology, geology, hydraulics, hydrology, microbiology, and mathematics to create solutions that protect and improve the health of living organisms while also improving the quality of the environment. Environmental engineering protects the health of the people and the planet. It creates solution to global issues like providing clear drinking water, clean air, etc. The basic scientific principles are applied to manage earth's resources and build and maintain both natural and engineered environments. Global environmental issues are resolved locally. New techniques are developed to lessen the severity of the problems and influence policy-making.
4. *Preventive Medicine* A discipline of medicine that focuses on sickness prevention in the community as a whole (which is an important part of public health) or in the individual. It also goes through the numerous elements that drive sickness progression and how to avoid it. The contemporary era in preventative medicine began with Louis Pasteur's discovery of living bacteria as a cause of disease in the mid-nineteenth century. Near the close of the twentieth century, the theory of disease transmission by insects was developed. Among the first serological tests developed were the Widal reaction for typhoid disease (1896) and the Wassermann test for syphilis (1906). A greater understanding of the principles of immunity assisted the creation of active immunisation against specific diseases. Antitoxin for diphtheria and arsphenamine for syphilis were two examples of parallel improvements in treatment that opened up new avenues for prevention. Sulphonamide medicines, and later antibiotics such as penicillin, streptomycin, chlortetracycline, and chloramphenicol, revolutionised bacterial illness prevention and treatment in 1932.
5. *Law* A major factor that influences environmental health. Stringent and stricter laws can be developed in order to protect the environment and keep the environment around us healthy. Legislations can be developed on national as well as international levels for protecting the environmental as well as public health with a holistic and collectivistic approach to the field. It is not that only the development of such legislations is enough, we also need to be able to reinforce them and detain anyone who tries to break such laws and provide them with appropriate punishments, hefty fines, and relevant environmental and community service as well.

Check Your Progress 3

1. Enlist the risks that are posed to one's health when exposed to toxic air pollutants.
-

2. When do we consider a waste material to be toxic?

.....

3. Briefly describe the factors that contribute to the health of the environment.

.....

6.7 NATURE AND ENVIRONMENTAL HEALTH

Environmental health is the science and practice of preventing human injury and illness and promoting well-being by identifying and evaluating environmental sources and agents. It helps in limiting exposures to hazardous physical, chemical, and biological agents in air, water, soil, food, and other environmental media or settings that adversely affect human health.

6.7.1 Temperature variation

Even small differences in seasonal average temperature are associated with increased illness and death. Temperature extremes can also worsen chronic conditions including cardiovascular, respiratory, cerebrovascular diseases, and diabetes conditions. It also has important indirect health effects. High temperature also raises the levels of ozone and other pollutants in the air that exaggerate cardiovascular and respiratory diseases. Pollen and other aeroallergen levels are also higher in extreme heat. This can trigger asthma, a major non-communicable disease, which affected around 262 million people (WHO, 2019).

High ambient temperature also affects the cardiovascular system. The main effect of ambient temperature variation on human system is abnormalities in blood vessels and homeostatic mechanisms which trigger a series of responses that may affect the cardiovascular system. Researches from different countries report that changes in ambient temperature after the profile of hospitalization, with an increased number of incidents of cardiovascular disorders, particularly in individuals with predisposing factors or comorbidities such as being elderly and having type II diabetes. Thus, it may be said that high ambient temperature leads to incidents of cardiovascular disease, mainly heat stroke, and the older adults are the most vulnerable to it.

6.7.2 Wind

25 peer reviewed studies have found that living near wind turbines does not pose a risk on human health. The association between wind turbines and health effects is highly debated. Some argue that reported health effects are related to wind turbine operations, shadow flicker, audible noise, low frequency noise, others suggest that when turbines are sited correctly, effects are more likely attributable to a number of subjective variables that result in an annoyed/stressed state. The available scientific evidence suggests that electromagnetic field, shadow flicker, low frequency noise, infra sounds from wind turbines are not likely to affect human health. However, some studies have found audible noise from wind turbines to be annoying to some people, and this may be associated with some self-reported health effects, for example, disturbance in sleep pattern.

6.7.3 Barometric Pressure and Altitude

Barometric pressure, also called atmospheric pressure, or air pressure, is the force or weight of the air surrounding us. Barometric pressure is measured by an instrument

called the barometer. One of the common types of barometers is the mercury barometer in which the height of the column of mercury exactly balances the weight of the column of the atmosphere. At standard sea level, the barometric pressure equals 760 mm of mercury. Temperature and altitude have an effect on the barometric pressure. It varies with altitude. However, the pressure is always low at high altitude irrespective of the weather

Effects of Barometric Pressure As the barometric pressure changes, there is a direct effect of that partial pressure oxygen. So just as that pressure of oxygen in our blood decreases when we go to high altitudes, it also decreases when barometric pressure goes down during a change in the weather. A rise in barometric pressure is generally considered an improvement in the weather while fall in barometric pressure may mean worsening weather. A fall in barometric pressure can affect health in various ways:

1. **Altitude Sickness** Also known as ‘mountain sickness.’ Altitude sickness can be understood as a group of symptoms that can be seen in a person if they have walked or climbed up to a higher altitude or elevation, too quickly. It is associated with headache, nausea, feeling of uneasiness, shortness of breath, fatigue, dizziness. This can happen due to the barometric or atmospheric pressure of the surrounding as when a person goes to higher altitudes, the atmospheric pressure drops on higher elevations and there is lesser availability of the oxygen. If people are already living in a place that is located at a higher altitude, they get used to that area’s barometric pressure but if someone travels to a higher altitude region, they need to give their body some time to adjust to the change in the barometric pressure. The altitude above 8000 feet can pose a risk for altitude sickness.

There are three levels of altitude sickness:

Acute Mountain Sickness (AMS) is the mildest form, and it’s very common. The symptoms can feel like a hangover with dizziness, headache, nausea, muscle pains, etc.

High-altitude Pulmonary Edema (HAPE) is a build-up of fluid in the lungs that can be very dangerous and even life-threatening. This is the most common cause of death from altitude sickness.

High-altitude Cerebral Edema(HACE) is the most severe form of altitude sickness and happens when there’s build-up of fluid in the human brain. It, too, is life-threatening, and you need to seek medical attention right away.

What are Altitude Sickness Symptoms?

Symptoms of Altitude Sickness include:

- Headache
- Dizziness
- Nausea
- Vomiting
- Fatigue and loss of energy

- Shortness of breath
- Problems with sleep
- Loss of appetite

Symptoms usually come on within 12 to 24 hours of reaching a higher elevation and then get better within a day or two as the body adjusts to the change in altitude. If one has a more moderate case of altitude sickness, their symptoms might feel more intense and not improve with over-the-counter medications. Instead of feeling better as time goes on, they will start to feel worse. They will have more shortness of breath and fatigue. They may also have:

- Loss of coordination and trouble walking.
- A severe headache that does not get better with over-the-counter medication
- A tightening in the chest

If one develops a severe form of altitude sickness like HAPE or HACE, they might have:

- Confusion
- Shortness of breath even at rest
- Inability to walk
- A cough that produces a white or pink frothy substance
- Coma

2. Worsening of Arthritis

Variations in the barometric pressure often flare up arthritis. People with arthritis are very sensitive to changes in the barometric pressure. When the barometric pressure changes, it makes the bones, muscles, tendons, etc., to expand and contract which creates worsening of the pain in the joints that are affected by arthritis. Barometric pressure is known to affect a person with arthritis more than the temperature and rainfall.

3. Acute headaches

People also experience acute headaches when there is a significant drop in the barometric pressure and these headaches can feel like a migraine for many people. In order to understand if the headache is caused by the changes in barometric pressure, the following symptoms can be kept in check:

- Nausea
- Vomiting
- Numbness in the neck and face
- Experience of pain in either or both of the temples
- Increase in the sensitivity to light

When the barometric pressure drops, there is a difference created between the pressure in the air that is outside and the air that is in the sinuses of the person which consequently

results in pain. A similar thing happens when we sit on an airplane, when the pressure of the air changes with the altitude, people often report experiencing a pop in their ears or even pains in the ear.

6.8 EFFECTS OF ENVIRONMENTAL AND CLIMATIC CHANGES ON HUMAN HEALTH

The direct and indirect effects of climate change on human health are becoming increasingly obvious. Direct effects include exposure to extreme weather events such as heat waves. Indirect effects including disruption to the economic and social activity which can impact health, for example it reduces people's ability to earn a livelihood. Other health related effects arise from environmental degradation, diseases carried by vectors, food and water-borne infections, changes to food security, and impacts on mental health such as elevated risk of suicide. In some cases, there can be health benefits, but in the clear majority of observed and predicted cases the health impacts of climate change are negative. Climate change can lead to increased infections from diseases such as malaria and dengue fever, and can have significant impacts on mental health. It can reduce the availability of drinking water, and affect the production of food, whether this is by growing crops or raising livestock while in some areas the effect on crops have been positive, in other's yields have fallen and some crops produced have been found to be less nutritious.

The health effects of climate change are increasingly a matter of concern for the international public health policy community. Studies have found that communication on climate change is more likely to lead to engagement by the public if it is framed as a health concern rather than just as an environmental matter. Health is one part of how climate change affects humans together with aspects such as displacement and migration, security and social impacts.

6.9 CLIMATE CHANGE AND MENTAL HEALTH

Climate change negatively impacts mental health. WHO's first global research priority is to assess mental health risk related to climate change. Evidences suggest a growing indirect effect of climate change is psychological distress, anxiety, and grief, which even occurs among people who have not personally experienced any direct negative impacts. This concept of climate or ecological anxiety and grief is far reaching due to extensive nature of climate change awareness that is made possible through present day technology-based communication. Climate change is a severe, ongoing and global threat that is largely characterized by uncertainty and lack of understanding. For this reason, anxiety and grief is a natural and rational response for those feeling fear or lack of control. Climate grief can be divided into three categories:

- Physical ecological losses
- The loss of environmental knowledge
- Anticipated future losses

Climate change may also have psychological effect on the brain and it may affect human's basic decision-making ability by 25 % and strategic thinking by 50% (Jones, et al 2014). Climate change also impacts an increase in infectious diseases. Extreme

weather events related to climatic change may lead to depression, and post-traumatic stress disorder. Even the gradual changes in climate conditions are also detrimental for mental health.

Check Your Progress 4

1. Define altitude sickness.
.....
2. Explain the relationship between climate change and mental health.
.....
3. How does Barometric pressure affect one's health?
.....

6.10 SUMMARY

To sum up what we have learnt in this unit, here is a quick recap:

- Environment and its health should be a concern for us.
- Environmental health comprises of those aspects of human health that includes quality of life, that are determined by physical, biological, social, and psychosocial factors in the environment.
- Stress is the result of an imbalance between environmental demands and human response capabilities. Acute stress, acute episodic stress and chronic stress are various types of stress. It is important to learn effective ways to cope and manage stress. Stress is often caused by something which is known as stressor. Major sources of stressors like pollution, noise, air, water, chemicals, etc.
- The areas contributing to environmental health are environmental epidemiology, environmental toxicology, environmental engineering, preventive medicine, and law.
- Temperature variation, wind, barometric pressure impacts environmental health.
- The effect of barometric pressure is altitude sickness, worsening of arthritis, and acute headaches. Altitude sickness can happen due to the barometric or atmospheric pressure of the surrounding as when a person goes to higher altitudes, the atmospheric pressure drops on higher elevations and there is lesser availability of the oxygen.
- Climate change has indirect effect on mental health resulting in psychological distress, grief and anxiety

6.11 KEYWORDS

- Altitude Sickness** : Barometric or atmospheric pressure of the surrounding as when a person goes to higher altitudes, a group of symptoms present in the individual. It is also known as mountain sickness.
- Environmental Epidemiology** : A branch of epidemiology that explores how human health is affected by exposure to the environment

Environmental Health : The science and practice of preventing human injury and illness and promoting well-being by identifying and evaluating environmental sources and agents

Episodic Acute Stress : Frequent periods of acute stress

Environmental Stressors : Things or events in our surroundings that cause stress

Stressors : Specific kinds of stimuli that place demands on the individual and poses a threat to the well-being

6.12 REVIEW QUESTIONS

1. The simulation method of measuring personal space was first developed by:-
 - a. Nagar
 - b. Kuethe
 - c. Hayduk
 - d. Gifford
2. Briefly explain a study that was conducted to understand how personal factors affect a person's preference for personal space.
3. Briefly describe various types of stress.
4. Which of the following is the most severe form of altitude sickness?
 - a. Acute mountain sickness
 - b. High-altitude pulmonary edema
 - c. High-altitude cerebral edema
 - d. None of the above
5. Define the term 'crowding'.
6. Briefly explain the stimulus overload model describing human-environmental interaction.
7. Briefly discuss how can one manage stress.

6.13 REFERENCES AND FURTHER READING

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6.14 ADDITIONAL ONLINE RESOURCES

- Creating Liveable Cities
<https://www.youtube.com/watch?v=QYrlNvhRjTY>
- Environmental Engineering
<https://www.youtube.com/watch?v=T2xFDIdjX88>
- Is the future of healthcare preventive medicine?
<https://www.youtube.com/watch?v=12Ab0EyAvU8>
- American Environmental Health Association: Environmental Health
<https://www.apha.org/topics-and-issues/environmental-health>
- Dr Hans Selye Canadian Medical Hall of Fame Laureate 2006
https://youtu.be/6Al3Wsf_gGs
- Stress
<https://www.webmd.com/balance/stress-management/stress-management>

<https://www.binghamton.edu/its/blog/Stress%20Relief%20Tips%20for%20Keeping%20your%20Calm%20During%20COVID-19%20Quarantine.html#article>

<https://www.healthline.com/health/headache/barometric-pressure-headache#treatment>

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