

Block 3

**Areas of Application of
Environmental Psychology**

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/>

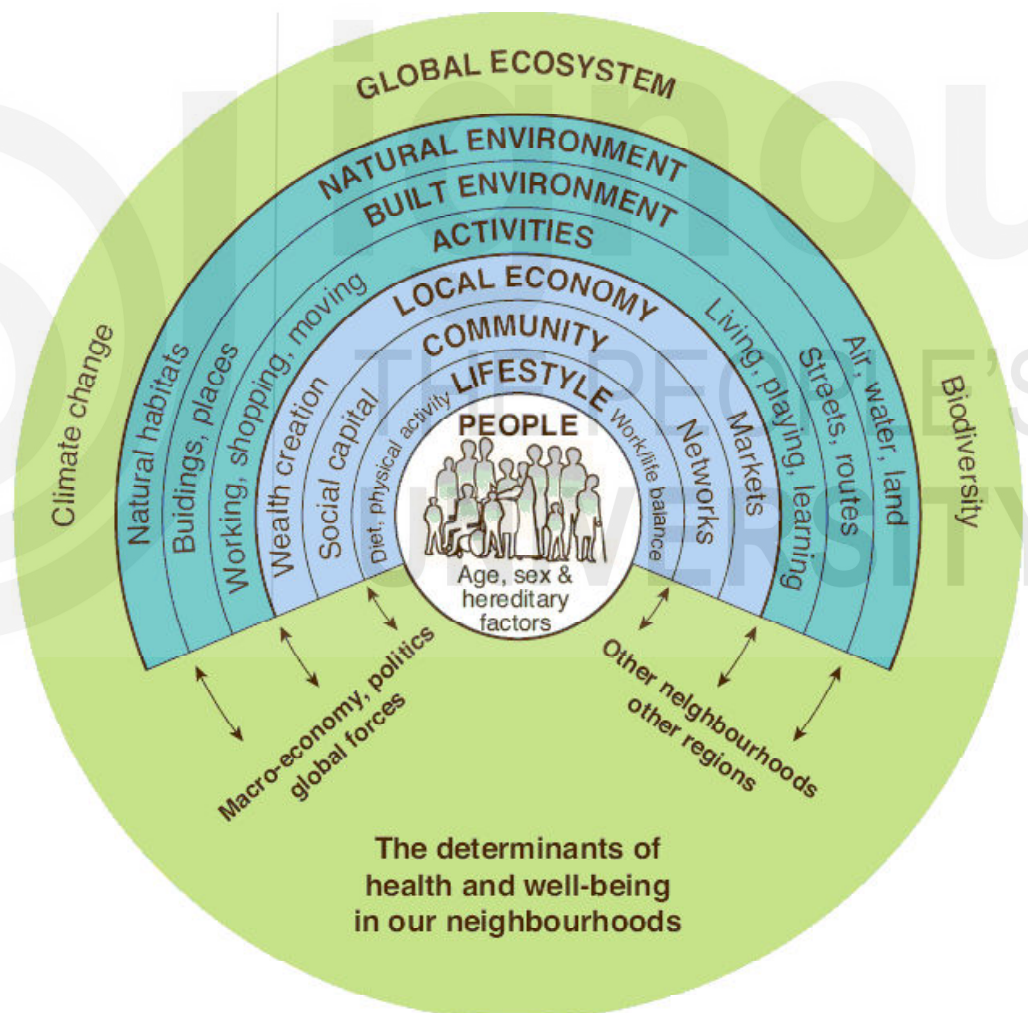


Figure 6.1 Determinants of health and well-being in our neighbourhoods

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 don't 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.

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

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

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

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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?

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2. Briefly mention the major types of pollution.

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

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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.

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

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

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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.

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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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UNIT 7 DISASTERS, TOXIC HAZARDS, AND POLLUTION*

Structure

- 7.0 Introduction
- 7.1 Natural Disasters
 - 7.1.1 Definition and Characteristics
 - 7.1.2 Categories of natural disasters
 - 7.1.3 Causes of Natural Disasters
- 7.2 Perception and Effects of Natural Disasters
- 7.3 Environmental Theories and Disasters
- 7.4 Technological Catastrophes
 - 7.4.1 Effects of technological disasters
- 7.5 Toxic exposure from industries, occupation, and household wastes
- 7.6 Air pollution and Behavior.
- 7.7 Role and functions of disaster management agencies in India
- 7.8 From Disaster to Resilience
- 7.9 Summary
- 7.10 Keywords
- 7.11 Review Questions
- 7.11 Reference and Further Reading
- 7.12 Additional Online Resources

Learning Objectives

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

- Explain the meaning, categories and causes of natural disasters
- Gain insight into the perception and effects of natural disasters
- Discuss the effect of toxic and non-hazardous wastes
- Elucidate the effect of technological disasters and air pollution on behaviour
- Appreciate the roles and functions of disaster management agencies in India, and
- Analyse the strategies to build more resilient communities in the wake of disasters

7.0 INTRODUCTION

Disasters are a complex worldwide crisis. It is an inevitable truth of nature, which cannot be prevented, only managed. Every year, millions of individuals and hundreds of communities get affected by different types of disasters all around the world. Such a

crisis situation not only impacts their physical health and surroundings, but also disrupts their mental health and well-being. Global economic and social development is frequently deterred by natural and man-made disasters. Further, developing countries are more prone to profound damage inflicted by disasters and environmental hazards. This is due to the various challenges such countries face, like extreme hunger and poverty, resource-crunch, poor educational facilities, lack of infrastructure, unavailability of skilled manpower, lack of awareness and limited knowledge of disaster mental health. In this Unit, we expand our understanding on the meaning, characteristics and causes of natural disasters. Perception, effects and theoretical perspectives on disasters will be introduced. Finally, the roles and functions of various stakeholders in disaster management will be discussed.

7.1 NATURAL DISASTERS

7.1.1 Definition and Characteristics

We are all familiar with environmental calamities that result in excessive property destruction, human life loss, or both. Untold human agony has been brought by earthquakes, tornadoes, floods, fires, storms, and avalanches. Although disasters caused by naturally occurring phenomena usually have minimal human involvement, there are moments when natural events and our impact on the environment intersect. A disaster is anything that has extremely bad implications for individuals who are impacted by it and is caused by the interaction of natural and societal events (Veitch and Arkkelin, 1995). This definition recognizes that a natural event is only a disaster if it has an impact on humans. A natural disaster is a major calamity caused by the earth's natural processes.

Characteristics of natural disasters Natural disasters are distinguished by the following characteristics:

- They occur suddenly.
- They are usually unpredictable, and even when we have some advance notice, we do not always know when the event will occur or what will happen.
- They are out of control
- They are incredibly powerful
- They are frequently acute, meaning they last only a few minutes rather than days (Oliver, 2008)

Some examples of natural disasters are tornadoes, severe storms, hurricane, tropical storms, floods, wildfires, earthquakes, droughts, volcanic eruption, tsunami, and landslide.

7.1.2 Categories of Natural Disasters

The natural disaster category is generally divided into six groups of disasters, namely, biological, geophysical, metrological, hydrological, climatological, and extra-terrestrial.

- a. **Biological disaster** – Biological disasters are natural events that result in widespread disease, disability, or death among humans, animals, and plants as a result of microorganisms such as bacteria, viruses, or poisons. Examples are, dengue, malaria, meningitis, HIV, Bird flu, Swine flu, Cholera, etc.

- b. Geophysical disasters**– They are potentially damaging natural events and/or phenomena that may cause the loss of life or injury, property damage, social and economic disruption, or natural degradation, extreme natural hazards are pre-manifestation of the complex, hierarchical and non-linear earth systems. Examples are, Volcanic eruption, earthquakes, landslides, mudflows, etc.
- c. Meteorological disasters** – These are caused by extreme weather such as rain, drought, snow, extreme heat or cold, ice or wind. Examples of weather disasters embrace blizzards, cyclones, hailstorms, heat waves, hurricanes, floods, and tornadoes.
- d. Hydrological disasters** – A hydrological disaster is a violent, sudden, and destructive change either in the quality of earth's water or in the distribution of the movement of water on land, below the sea-level or in the atmosphere. Examples are, floods, limnic eruptions (eruption of carbon dioxide present in the deep waters of a lake that creates gas cloud), puddle, landslides.
- e. Climatological disasters** – These are events that are brought about by drastic fluctuations of the climate states and variabilities. Or, these are a phenomenon that is a result of climate fluctuations that shift outside of their normal state to different factors that impact the climate. Examples are El Niño Southern Oscillation, La Niña, enhanced greenhouse effect (climate change), acid deposition, ozone depletion.
- f. Extra-terrestrial disasters** – These are hazards caused by asteroids, meteorites, and comets as they pass near Earth, enter the earth's atmosphere, and/or strike the earth. They cause changes in interplanetary conditions that affect the earth magnetosphere, ionosphere, and thermosphere. Examples are, meteorites, interstellar dust, explosion from comets, nuclear accidents in space.



Figure 7.1 Natural Disasters

Source: <https://www.ncei.noaa.gov>

7.1.3 Causes of Natural Disasters

Earthquakes, flooding, volcanic eruptions, landslides, hurricanes, and other natural calamities can all contribute to a natural disaster. To be classified as a disaster, it must have a significant environmental impact, as well as human loss and, in many cases, financial loss.

Natural disasters are caused by natural events such as extreme weather conditions or movements of the earth's surface that tend to be localized in certain areas of the world, and they are remembered vividly because of their dramatic nature. For example, Hurricanes form over moisture-rich oceans and coastlines, such as the Atlantic Ocean, Caribbean Sea, and the Gulf of Mexico, whereas earthquakes occur along fault lines in the earth's crust.

Avalanches of snow or excessive rainfall leading to flooding can also cause disasters; the magnitude of the disaster may be exacerbated by human intervention in some areas, but humans are not directly responsible for the events (Oliver, 2008). Soil erosion, seismic activity, tectonic movements, air pressure, and ocean currents, among other factors, all contribute to natural disasters. The main causes of these disasters are natural activities occurring in the earth's crust as well as on the surface.

Check Your Progress 1

1. Enlist the major characteristics of natural disasters.

.....

2. Give some examples of natural disasters that have been recent.

.....

3. Briefly describe the 6 categories of natural disasters.

.....

7.2 PERCEPTION AND EFFECTS OF NATURAL DISASTERS

Perception of natural hazards and disasters involve intuitive judgments, beliefs, and attitudes adopted by individuals and groups of people about the likelihood and occurrence, and mechanism of development of such phenomenon. The subjective nature of the understanding of natural hazards influences people's decisions.

Risk perception is influenced by many factors which are firstly related to the nature of the hazard itself and secondly to psychological, social, and cultural components and their mutual interactions. In the case of natural hazards, risk perception analysis has to take into account that they vary immensely from certain events such as flash floods, avalanches, or earthquakes to long-lasting phenomena such as heatwaves and droughts. Most comparative studies focus on human-induced dangers whereas risk perception of natural hazards has been researched less.

Some limitations of human risk perceptions are related to psychological mechanisms. Natural disasters may cause unpleasant feelings of anxiety and lack of sense of security. For this reason, each individual's emotional and psychological traits have an impact on their perception.

Effects of Natural Disasters

Natural disasters generally affect the physical infrastructural facilities, agricultural productivity, and even lead to loss of life and cause property damage. Various factors influence the effects that are disastrous for a country, like the magnitude of the disaster

and geographic location of the affected area and recovery efforts directed towards reducing immediate effects of a disaster. Failure to mitigate various short term economic effects of a disaster affects the long-term economy of the country. The primary effects are direct results of a natural disaster such as collapsed buildings and waste damage. Secondary effects are the result of primary effects. The effect of natural disasters is both short-term including loss of life and damage to property and long-term affecting the economic stability of a region or a country.

7.3 ENVIRONMENTAL THEORIES AND DISASTERS

Over the centuries there have been four fundamental theories about the disaster, which have conceived disasters as acts of fate/acts of God, acts of nature, joint effects of nature and society, and social construction, respectively. Let us explore them.

Acts of fate/acts of God For millennia, disasters were considered to arise from impersonal and uncontrollable sources either from unfortunate alignments of stars and planets or acts of God that were beyond human understanding. Both forms of this theory viewed disasters as predetermined and thus completely beyond the victim's control. A variation on this theory was that disasters were cosmic or divine retribution for human failings- personal disasters for personal failings, and collective disasters for societal failings.

Acts of Nature Overtime increased scientific knowledge led many people to substitute natural causes for supernatural ones. Thus floods occur because of a large amount of rainfall from a serious form exceeded capacity to absorb it. Accordingly the term natural disaster came to refer to an outside attack upon social systems that broke down in the face of such assaults (Quarantelli, 1998).

Joint effects of Nature and Society It was proposed that hazards arise from the interaction of a physical event system and human use system. Thus, it takes both the hazardous event system and the vulnerable human use system to produce disaster

According to this view, human societies adapt to the prevailing environmental conditions, e.g., temperature, wind speed, precipitation, seismic activities, at a given location. Unfortunately, they fail to anticipate the variations in those environmental conditions; consequently, their adaptation to normal conditions usually is inadequate for extreme events – blizzards, heat waves, tornadoes, hurricanes, and floods.

Social Constructions Most recently researchers have recognized that disasters are quite systematic in the types of people they harm as well as the type of geographical location and use systems they impact. While the interactive theory is concerned with hazard-exposure at specific locations and physical vulnerability of specific structures, the social construct theory calls attention to the social vulnerability of specific population segments. To say that hazard vulnerability is socially constructed does not mean that people are vulnerable because they think the wrong thoughts, as most people would categorize the belief that floods are caused by alignments of planets and stars. Rather, socially vulnerable population segments emerge because their psychological, demographical, economical, and political processes tend to produce them.

Check Your Progress 2

1. What are the major effects of natural disasters?

2. What does the joint effects of natural and society theory propose?

.....

3. Which theory of environmental disaster has been propagated from ages?

.....

7.4 TECHNOLOGICAL CATASTROPHES

A technological disaster or catastrophe is an event caused by a malfunction of a technological structure and/or some human error in controlling or handling the technology. Technological disasters are classified as man-made catastrophes since they have an “identifiable cause” feature. As a result of this trait, the impact on communities is frequently more negative. The consequences of a tragedy on families and people can be long-lasting and persist for years. Symptoms, on the other hand, may arise gradually and the effects may not be seen right away.

Bhopal Gas tragedy can be considered to be an example of a technological disaster. It occurred in December 1984 in Bhopal and still terrorizes people because toxic Methyl Isocyanate (MIC) leaked from the Union Carbide factory. The gas spread out silently, engulfing the highly inhabited neighborhoods surrounding the factory. People awoke gasping for air and dashed outside, only to inhale more of the lethal gas. Many people perished while sleeping, while others became blind. Several people developed post-traumatic ailments over time, and many continue to do so now. This was one of the deadliest chemical disasters in history, with over 10,000 people killed (the exact figure is unknown) and over 5.5 million people afflicted and suffering from excruciating injuries. The catastrophe occurred as a result of human error and poor manufacturing supervision. Unfortunately, numerous industries in India continue to operate with little government pressure on the implementation of safety standards as spelled out by the authorities in their Standard Operating Procedures.

Box 7.1 Chernobyl Disaster

Chernobyl disaster is one the worst nuclear disasters that occurred in the Chernobyl nuclear power station in the erstwhile Soviet Union on April 25 and 26, 1986. Human mistakes combined with others, resulted in several massive explosions. Many people contracted radiation sickness and many of them succumbed to radiation-induced illnesses as well as cancer in the long term.

Large amount of radioactive material was released into the atmosphere, millions of acres of forests were destroyed, livestock were born with deformities, and humans suffered negative impact on both their physical and mental health. Such incidents highlight about the decision-making process and its related consequences.

Technological disasters can be further sub-divided into:

- Industrial (chemical spills, collapse, explosion, fire, gas leak, poisoning, radiation, and others)
- Transport (air, rail, road, water, miscellaneous accidents, fire collapse, explosion, and others)

7.4.1 Effects of technological disasters

Technological disasters are especially stressful because they are unpredictable. Individuals, families, and communities are affected. Some of the results include income loss, loss of job security, uncertainties about the future, family conflict, and stress.

Several publications were generated in the aftermath of several disasters in the mid-1980s, which began to pinpoint the implications for individuals. It became clear that there were unanticipated effects. Following a traumatic occurrence, shock, sadness, and psychological disruption are to be expected. However, researchers at the Institute of Psychiatry in London, such as James Thompson, revealed two major “surprising” findings. To begin with, psychological effects were not always instantaneous and generally did not manifest until several months following the occurrence, which might be as long as 9-12 months in certain circumstances. Second, the repercussions were comparable to and as severe for personnel on the scene as they were for direct survivors who had been directly involved in the incident. The latter result led to the understanding that delayed, severe, and long-term impacts were both prevalent and routine for workers involved in lesser incidents, such as road traffic accidents. This has far-reaching ramifications for emergency personnel’s training and support systems. Indeed, it is now widely acknowledged that simply viewing disaster coverage on television or being aware of terrible events in one’s neighborhood can cause psychological anguish. What is evident is that (a) disasters affect a significant number of people; (b) these consequences are not restricted to large-scale events, and (c) we do not know the full scope of these effects.

Furthermore, it became evident, at least in the United Kingdom, that rescue services and psychological support services were not fully prepared to deal with such widespread trauma. Attempts to comprehend and cope with the psychological response to catastrophes, as well as attempts to understand the causes of technical disasters and accidents in terms of human mistakes and person-machine interaction, provide psychological input.

The literature has concentrated on three groups in order to understand the psychological impacts observed: survivors, bereaves, and employees involved at the scene. Much of what we know now comes from crisis response, where psychologists worked with people who had been involved in severe disasters. The Centre for Crisis Psychology in Yorkshire (UK), directed by Peter Hodgkinson and Micheal Stewart, has demonstrated such a response. These workers have supplied a wealth of knowledge based on their own experience, but clearly, there is still much more to be done.

Those who survive disasters are commonly referred to as victims, and there are two points worth emphasizing about this term. First, it emphasizes the fact that the consequences are extreme, and that many people who lived through the event do not survive. To survive is to return to a relatively normal existence similar to that which existed before the disaster, and many people do not make it. Second, some researchers oppose to the term victim because it suggests helplessness and an incapacity to recover on the part of the person and have instead suggested using the term catastrophe impacted person, which has a less negative connotation.

Robert Jay Lifton, who interviewed some of the Hiroshima survivors retrospectively in 1967, is credited as being the first to study the psychological impact of disasters. According to Lifton, death imprint refers to a tendency to release the experience in

vivid flashbacks, either awake or asleep, as if the imprint of the event has been indefinitely stamped on the mind: regret for living when others died, as well as guilt over not doing enough to save others. The repression of sentiments and emotions concerning the occurrence is referred to as a psychic number, as if a feeling has been fully switched off.

The inclination to be furious and irritated with offers of aid that one believes others truly do not understand, as well as the isolation of one of the most powerful mediators of the process, social support, are referred to as nurture and conflicts. The desperate and continuous search for meaning, which contradicts completely the construction of reality, which is to some extent predictable, controllable, and with some degree of scrutiny after such an event, it is difficult to believe in anything. This quest can be positive if it leads to working through and acceptance of the event.

Guidelines for Coping with Stress in the Event of a Technological Disaster

Individuals need to take the following steps:

- Maintain as much of a routine as possible.
- Reduce the amount of media coverage of the event.
- Maintain a healthy lifestyle and discover healthy ways to relieve stress, such as going outside, exercising, and completing stress-relieving exercises.
- To have a better understanding of the situation, look for reliable sources of information.
- Speak with someone you can trust.
- Maintain an optimistic attitude: *you will get through this!*
- If you are sad, nervous, or having difficulties controlling your emotions, seek professional treatment.

The following steps need to be taken by couples:

- Talk about what they are going through with each other.
- Please be patient with one another.
- If you lose your job, talk about how you will pay your bills and make a plan.
- If the relationship is too stressful, seek counseling.
- The effect of any crisis on children is largely determined by how adults in the household react.

Parents are recommended to do the following to help children cope with stress:

- Limit the exposure to disaster coverage on television.
- Answer all inquiries a youngster may have honestly and in a language that a child can understand.
- Maintain a positive attitude and concentrate on how things will improve.

When it comes to children, know when to seek expert aid. Significant behavioral changes, especially those that endure for a long time, can indicate that a kid is having difficulties (Evans & Wiens 2004).

7.5 TOXIC EXPOSURE FROM INDUSTRIES, OCCUPATIONS, AND HOUSEHOLD WASTES

Toxic industrial chemicals, including chlorine, phosgene, hydrogen sulfide, and ammonia have variable effects on the respiratory tract and maybe seen alone or in combination. Other toxins include the effects of cyanide, carbon monoxide, and fire suppressants. Toxic exposure is defined as the direct or indirect contact with any natural or man-made substances or agents that can lead to deleterious changes in body structure or function including illness or death. Toxic materials may enter the body in different ways—these are called the routes of exposure. The most common route of exposure is through inhalation (breathing it into the lungs). Toxic industrial materials are chemicals other than chemical warfare agents that have harmful effects on humans. Toxic industrial materials or chemicals are used in a variety of settings such as manufacturing facilities maintenance areas, and general storage areas. Chemical waste is typically generated by factories, processing centers, warehouses, and plants.

Household wastes also known as domestic waste or residential waste is disposable materials generated by households. This waste can be comprised of non-hazardous waste and hazardous waste. Non-hazardous waste can include food, scraps, paper, bottles, etc. which can be recycled or compost. Household hazardous waste and demolitions include motor oil, automobile batteries, paints and solvents, household cleaners, drain openers, pesticides, compressed gas tanks, such as propane and oxygen. Disposing of waste has a huge environmental impact and can cause serious problems. Some wastes will eventually rot, but not all and in the process, it may smell or generate methane gas which is explosive and contribute to the greenhouse effect. Leachate, produced as waste decomposes, may cause pollution.

Industrial waste is defined as the waste generated by manufacturing or industrial processes. The types of industrial waste generated include cafeteria garbage, dirt, and gravel, masonry, and concrete, scrap metals, trash, oil, solvents, chemicals, weed grass, and trees, wooden scraps, lumber and similar wastes. Occupational hazards are risks of illness or accidents in the workplace. In other words, hazards that workers experience in their place of work are called occupational hazards. It is something unpleasant that a person experiences or suffers as a result of doing their jobs, it also means risk.

Poor waste management contributes to climate change and air pollution and directly affects many ecosystems and species. Landfills are considered as the last resort in waste hierarchy. They release methane, a very powerful greenhouse gas linked to climate change. Inefficient municipal solid waste management systems may also create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains, and loss of biodiversity.

7.6 AIR POLLUTION AND BEHAVIOR

Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings or cause damage to the climate or to materials. There are many different types of pollutants such as gases including ammonia, carbon monoxide, sulfur dioxide, methane, carbon dioxide, chlorofluorocarbons, particulates, both organic and inorganic, and biological molecules. Air pollution may cause diseases, allergies, and even death to humans. It may also cause harm to other living organisms, such as animals and food crops, and may damage the natural environment, for example, climate change, ozone depletion, or habitat degradation, or built environment, for

example, acid rains. Both human activity and natural processes can generate air pollution. Air pollution is a significant risk factor for a number of pollution-related diseases, including respiratory infections, heart diseases, Chronic Obstructive Pulmonary Disease, stroke, and lung cancer. Growing evidence suggests that air pollution exposure may be associated with reduced IQ scores, impaired cognition, increased risk for psychiatric disorders, such as depression, and detrimental perinatal health.

Psychological and toxic effects of air pollution can lead to psychiatric symptoms including anxiety, and changes in mood, cognition, and behavior. Air pollution also impacts the level of stress, studies have confirmed air pollution increases crime, polluted air increases, anxiety, which can, in turn, lead to a rise in criminal or unethical behavior. Studies have concluded that cities with high levels of air pollution had higher levels of crime; further studies have confirmed that air pollution can contribute to annoyance, anxiety, depression, and general dissatisfaction with life. Pollution is also linked to substance abuse, self-harm, suicide, as well as crimes.

Check Your Progress 3

1. Briefly describe the various types of toxic waste.
.....
2. How does air pollution affect human behaviour? Describe briefly.
.....
3. Which of the chemicals are considered to be toxic industrial chemicals?
.....

7.7 ROLE AND FUNCTIONS OF DISASTER MANAGEMENT AGENCIES IN INDIA

Various disaster management agencies play a pivotal role in the management of disasters when a disaster has occurred.

Role of the Union Government Even though the State government is primarily responsible for the management of the crisis and disaster but the Union or the Central government plays an integral role in providing financial and physical resources, helping with complementary measures like early warnings, coordinating with different departments, and ministries and organizations. There is also a Cabinet Committee on Natural Calamities, at the highest level, that reviews the crisis at hand.

There is a high-level committee of ministers that runs under the chairpersonship of the Agriculture Minister and it mainly works with the issues related to financial support that is supposed to be provided to the State governments from the National Disaster Response Fund, in case the state governments do not have enough funds available to them. There is another committee, Cabinet Committee on Security that handles matters related to biological, nuclear, and chemical emergencies.

National Crisis Management Committee The National Crisis Management Committee (NCMC) is led by the Cabinet Secretary, who is the senior executive officer. NCMC is made up of secretaries of important ministries and departments, as well as leaders of other organizations. It examines and monitors crisis circumstances

regularly, and offers orders to the Crisis Management Group as needed. The NCMC has the authority to instruct any ministry, department, or organization to take a particular action in response to a crisis.

Since disaster management is a multi-disciplinary process, all Central Ministries and Departments play an important role in disaster management. Due to the highly technical and specific character of many catastrophe occurrences, such as aviation disasters, rail accidents, chemical disasters, and biological disasters, among others, the ministries responsible for that topic have nodal responsibility for dealing with that sort of disaster.

Nodal Ministries/Department for Disaster Management at the National Level:

- i. Droughts – Ministry of Agriculture
- ii. Epidemics and Biological Disasters – Ministry of Health and Family Welfare
- iii. Chemical or Industrial Chemical Disasters – Ministry of Environment and Forest
- iv. Nuclear Accidents – Department of Atomic Energy
- v. Railway Accidents – Ministry of Railways
- vi. Air Accidents – Ministry of Civil Aviation
- vii. Natural Disasters except for Drought and Epidemics and Civil Strife – Ministry of Home Affairs

The Secretaries of the Government of India's Nodal Ministries and Departments, such as the Ministry of Home Affairs (MHA), Agriculture, Civil Aviation, Environment and Forests, Health, Atomic Energy, Space, Earth Sciences, Water Resources, Mines, Railways, and others, are all members of the National Executive Committee (NEC) and serve as nodal agencies for specific disasters based on their core competencies or as assigned to them.

The National Executive Committee (NEC), which is led by the Home Secretary, coordinates amongst several nodal ministries/departments. The NEC is responsible for developing a national disaster management strategy based on the National Disaster Management Policy.

Box 7.2 National Disaster Management Authority, Government of India

The National Disaster Management Authority (NDMA), headed by the Prime Minister of India, is the apex body for Disaster Management in India. Setting up of NDMA and the creation of an enabling environment for institutional mechanisms at the State and District levels is mandated by the Disaster Management Act, 2005. NDMA is mandated to lay down the policies, plans and guidelines for Disaster Management. India envisions the development of an ethos of Prevention, Mitigation, Preparedness and Response. The Indian government strives to promote a national resolve to mitigate the damage and destruction caused by natural and man-made disasters, through sustained and collective efforts of all Government agencies, Non-Governmental Organizations and People's participation. This is planned to be accomplished by adopting a Technology-Driven, Pro-Active, Multi-Hazard and Multi-Sectoral strategy for building a Safer, Disaster Resilient and Dynamic India. It empowers all the stakeholders to improve the effectiveness of Disaster Management in India.

Crisis Management Group (CMG) The Crisis Management Group (CMG) is made up of nodal officers from many ministries with a stake in the outcome. Apart from CMG, the National Executive Committee, led by the Home Secretary, is responsible for the DM Act's statutory coordination and duties.

The CMG's responsibilities include reviewing annual contingency plans formulated by various ministries, departments, and organizations in their respective sectors, coordinating the activities of the Union Ministries and State Governments in relation to disaster preparedness and relief, and obtaining information from nodal officers on all of these issues. In the case of a disaster, the CMG meets often to monitor relief activities and gives all necessary support to the afflicted nations to help them overcome the crisis. Meetings with the Resident Commissioner of the concerned state are also held.

Funding Mechanism Each state has a fund called the State Disaster Response Fund, which is managed by a state-level commission overseen by the State Government's Chief Secretary. The amount of the corpus is calculated based on the state's usual expenditure on relief and rehabilitation during the previous 10 years. If the funds available via the State Disaster Response Fund are insufficient to fulfill the specific needs, State Governments can seek help from the National Disaster Response Fund, which was established at the national level. Both of these programs are for relief and rehabilitation, as their names imply, and do not support mitigation or reconstruction, which must be paid independently by the state or national governments.

Role of State Government In India, it is the state government's primary role to provide rescue, relief, and rehabilitation in the case of natural disasters. The whole system of crisis management in state governments has been geared for post-disaster assistance and rehabilitation since the outset. Relief Commissioners are in charge of relief and rehabilitation initiatives in the majority of states. The majority of states have established a Disaster Management Department with the necessary connections to the many developments and regulatory departments involved in the prevention, mitigation, and preparedness.

Every state has a Crisis Management Committee, chaired by the Chief Secretary and comprised of secretaries in charge of concerned departments, that reviews crises daily during a crisis, coordinates all departments' activities, and provides decision support to the district administration. A Cabinet Committee on Natural Calamities, chaired by the Chief Minister, takes stock of the situation and is responsible for all major policy decisions at the ministerial level.

Role of District Administration The general administration of catastrophes in the district is the duty of the District Magistrate/Collector. Under the rules of the General Financial Rules/Treasury Codes, he can mobilize the response apparatus and has been given financial rights to draw money. During a disaster, all departments of the State Government, including the police, fire services, public works, irrigation, and so on, work together under the direction of the Collector, with the exception of metropolitan regions, where the municipal government plays a prominent role. The District Collector also has the authority to ask the Armed Forces for help if the situation warrants it. In recent years, NGOs have proven to be helpful in providing relief, rescue, and rehabilitation.

Role of Local Self-governments Following the 73rd and 74th Amendments to the Constitution, local self-governments, both rural and urban, have arisen as key layers of governance. In addition to being intimately interwoven with the community, they are

also the closest administrative units and are among the first responders to any crisis. Under the general direction of the District Administration, these units can thus play a significant role in crisis management.

Role of NGO/Civil Society/Media/Public In the event of a disaster, the local community is usually the first to respond. Traditional disaster management expertise and appropriate countermeasures are also carried by the local community. As a result, with the support of non-governmental organizations (NGO), the media, and the role of the local community must be utilized. They are encouraged to take part in all three phases of disaster recovery. The district government also needs to focus on disaster management capacity building, involvement, and empowerment of these stakeholders.

For a speedy, efficient, and effective reaction, community activity supported by local NGOs, as well as government apparatus, is required. Healthy coordination between local administration and local community/NGOs is required for this. Local NGOs and civic society must seek to instill in society a deep culture of safety and prevention. In a democracy, NGOs, civil society, and the media all play an active role as pressure organizations, allowing any government inaction to be detected and corrected. As a result, the general people and NGOs should keep a careful eye on how the government handles disasters and act as watchdogs.

Natural hazards are endemic to our geology, geography, climate, social, and cultural environments, but we can surely endeavor to manage crises more effectively so that dangers do not devolve into disasters. With a well-thought-out crisis management strategy in place, it is conceivable to envision our country, despite its numerous dangers, as a place free of all calamities in the future.

The work of announcing a policy, promulgating a law, or establishing an institution in the field of crisis management is relatively simple; the complexity lies in putting policies in place to accomplish the desired goals. Crisis management, a governance issue that is both vital and complex, is at the core of India's administrative system.

In order to speed up the administration's emergency reactions and raise the effectiveness of the machinery to handle crisis situations and improve crisis readiness, the system requires innovative thinking and fundamental reforms. To that end, it is critical that the crisis management apparatus perform and deliver. What is required is the introduction of a new paradigm in terms of the quality and efficacy of our institutional capabilities and delivery systems, while also ensuring that they are anchored in both authority structures and accountability procedures.

Our goal should not only be to have more efficient governance systems, but also to have innovative ways of capacity building and empowerment of all stakeholders at all levels, including panchayats and the community, strategic applications of science and technology, the establishment of a reliable emergency communication network, the construction of safe homes and infrastructure, and learning from research and development as well as previous experiences with crisis situations.

Each of these responsibilities is difficult and necessitates well-thought-out planning and implementation strategy, as well as coordinated efforts from a number of stakeholders both inside and outside the governmental structure. Our goal should be to create synergy and convergence between technological and knowledge-based advances and our diverse socio-cultural practices and indigenous coping mechanisms. The hallmarks of the disaster management method have been systematic preparedness, early warning, swift response, and long-term rehabilitation.

The contributions of numerous research and technology institutions are critical to disaster management. Indeed, advances in science and technology have resulted in significant advancements in disaster management efforts. Because crisis management is multidisciplinary, relevant research is conducted by a variety of sector-specific research and development organizations. The National Disaster Management Authority, with the help of National Institute of Disaster Management, may be able to enable a shared platform between science and technology organizations and users of relevant technologies, according to the 2nd Administrative Reforms Committee. Such systems could be implemented at both the federal and state levels.

7.8 FROM DISASTER TO RESILIENCE

Disaster resilience has become increasingly important in the present times. The community needs to be better prepared and equipped, be more resilient and thereby less vulnerable in the wake of disasters. Therefore, all the stakeholders, public, private and the civic sectors need to make efforts to adapt and act effectively in the crisis situation. The following components need to be strengthened:

Professionalization of Disaster Management The lack of properly qualified employees has definitely hampered the country's institutional growth for disaster management. While civil servants and other senior personnel in organizations such as the police, armed forces, and municipal bodies have played a leadership role in the past and will continue to do so in the future, it is past time to pay special attention to the country's long-felt need to professionalize disaster management. The tactics and procedures perfected by various industrialized countries in disaster management are the finest practices, and India can benefit from exposure to these principles. It is, therefore, desirable that the possibility of bilateral agreements with foreign governments for the exchange of experiences and learning from their documentation and research efforts be fully explored.

Use of Social and Mass media When it comes to crisis awareness, the media plays a critical role. Immediately following a major disaster in any part of the world, communities' curiosity and fear about their own danger are at an all-time high. This is a good time to run public awareness campaigns and use the media to raise awareness about the dangers that the community faces. The only way to achieve this is for the media and the disaster management system to work together. Lessons learned from previous disasters or from disasters in other places could be a useful contribution to such awareness-raising programs. The specifics of all such disasters must be adequately documented and kept in the public domain for this reason. These facts, as well as the lessons learned, should be made available on the websites of the District Disaster Management Authorities (DDMA), the State Disaster Management Authorities, and the NDMA.

Building Community Resilience The community is also a reservoir of traditional knowledge and skills, which must be incorporated into the risk reduction process. It is vital to educate the community about disaster risk reduction in general, as well as to impart skills and assign specific duties to community members, in order for the community to be prepared the first response from the community is a well-coordinated one.

Focus on District Disaster Management Plan The district's hazard, risk, and vulnerability profile need to be discussed by the administration. The district's vulnerability map, as well as the historical profile of major catastrophes that have occurred in the past, their impact on the district, and how the district has dealt with them, should be known to the administration. What is the district's current level of preparedness? Is the district prepared to deal with a calamity if it occurs now? What is the district administration's or DDMA's current capacity for search and rescue, relief distribution, logistics, ensuring life-line services, providing security and safety to the people, law and order situation, resource mobilization, and so on? All of these inquiries must be answered by the administration. This would provide an indication of the district's capacity as well as a starting point for planning. After that, the administration, or DDMA, consolidates the district's risks and moves the level forward.

Fact check on statistics related to natural disasters!

<https://ourworldindata.org/natural-disasters>

- On an average almost 60,000 people die due to natural disasters every year across the globe.
- On a worldwide level, disasters contribute to 0.1% of deaths over the last 10 years of time
- Deaths caused by natural disasters have seen a major decline over the last century from millions of deaths every year to an average of 60,000 deaths
- Poverty stricken population is the one that is most highly affected by natural disasters with high number of deaths and property.

Check Your Progress 4

1. What are the functions of local self- government in disaster management.

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.....

2. Suggest strategies to make the community resilient in the wake of disaster.

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.....

.....

7.9 SUMMARY

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

- A natural disaster is a major calamity caused by the earth's natural processes. Natural disasters are sudden, unpredictable, out of control and are intense. The main categories of natural disasters are biological, geophysical, metrological, hydrological, climatological, and extra-terrestrial.
- Natural disasters are caused by extreme weather conditions or movements of the earth's surface that tend to be localized in certain areas of the world.

- The risk perception at the time of disaster is influenced by many factors which are firstly related to the nature of the hazard itself and secondly to psychological, social, and cultural components and their mutual interactions.
- The main perspectives on disasters have been as acts of fate/acts of God, acts of nature, joint effects of nature and society, and social constructions.
- A technological disaster or catastrophe is an event caused by a malfunction of a technological structure and/or some human error in controlling or handling the technology. Technological disasters are especially stressful because they are unpredictable. Individuals, families, and communities are affected.
- Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings or cause damage to the climate or to materials. air pollution can contribute to annoyance, anxiety, depression, and general dissatisfaction with life. Pollution is also linked to substance abuse, self-harm, suicide, as well as crimes.
- Significant roles and functions are played by the various levels of government in case of a disaster. There are various committees and ministries that are dedicated towards relief work to manage a natural disaster. As a way forward, it is important to professionalise disaster management, constructively use social media, build a resilient community and focus on district disaster management plan.

7.10 KEYWORDS

Industrial Waste	: Waste generated by manufacturing or industrial processes
Natural Disaster	: A major calamity caused by the earth's natural processes
Occupational Hazards	: Are risks of illness or accidents in the workplace
Technological Disaster	: An event caused by a malfunction of a technological structure and/or some human error in controlling or handling the technology

7.11 REVIEW QUESTIONS

1. Briefly explain the theories related to environmental disasters.
2. What do you mean by hydrological disasters?
3. How are extra-terrestrial disasters caused?
4. Define technological disaster.
5. What are the two further sub-categories of technological disasters?
 - a. Industrial and chemical
 - b. Industrial and transport
 - c. Transport and legal
 - d. Air-born and water-born

6. Briefly discuss the role played by the union government in the management of disasters.
7. What does NCMC stand for?
 - a. National Crisis Management Committee
 - b. National Crisis Management Chair
 - c. Nagpur Crisis Management Committee
 - d. New York Crisis Management Committee
8. Which of the following ministries/department is responsible for handling droughts?
 - a. Ministry of Health and Family Welfare
 - b. Ministry of Railways
 - c. Ministry of Home Affairs
 - d. Ministry of Agriculture
9. Who handles and manages the State Disaster Response Fund?
 - a. Chief Minister
 - b. Commissioner
 - c. State Government's Chief Secretary
 - d. District Magistrate
10. What does DDMA stand for?
 - a. District Disaster Management Authority
 - b. District Drought Managing Association
 - c. District Drought Management Affiliation
 - d. None of the above

7.12 REFERENCES AND FURTHER READING

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7.13 ADDITIONAL ONLINE RESOURCES

- Causes and Effects of Climate Change. National Geographic
https://www.youtube.com/watch?v=G4H1N_yXBiA
- Disasters of Extra-terrestrial origin
Disasters of extraterrestrial origin | World Problems & Global Issues | The Encyclopedia of World Problems (uia.org)
- Natural Disasters
<https://ourworldindata.org/natural-disasters>
- Psychological impact of natural disasters on adults
Psychological Impact of Natural Disasters in Adults - University of Houston (uh.edu)
- Chernobyl Disaster
<https://www.prindlepost.org/2019/07/moral-and-existential-lessons-from-chernobyl/#:~:text=Some%20of%20th>

Chernobyl disaster | Causes, Effects, Deaths, Videos, Location, & Facts | Britannica

Answers to Review Questions

5. (b); 7 (a); 8 (d); 9 (c); 10 (a)

