Study Material On Business Environment and Ethics (18MBA109)

1st Semester

Definition:

Definition of Business Environment is sum or collection of all internal and external factors such as employees, customers' needs and expectations, supply and demand, management, clients, suppliers, owners, activities by government, innovation in technology, social trends, market trends, economic changes, etc. These factors affect the function of the company and how a company works directly or indirectly. Sum of these factors influences the companies or business organisations environment and situation.

Business environment is the sum totals of all factors external to the **business** firm and that greatly influence their functioning. It covers factors and forces like customers, competitors, suppliers, government, and the social, cultural, political, technological and legal conditions.

Business Environment means Businesses function within the environment and have to negotiate their way through it. Economists have classified Business Environment as Static environment, Dynamic environment, Internal environment, External environment, market environment, and Non-market environment including stake holders and shareholders.

Internal Environment:
The **internal business environment** comprises of factors within the company which impact the success and approach of operations. The company has control over these factors. It is important to recognize potential opportunities and threats outside company operations.

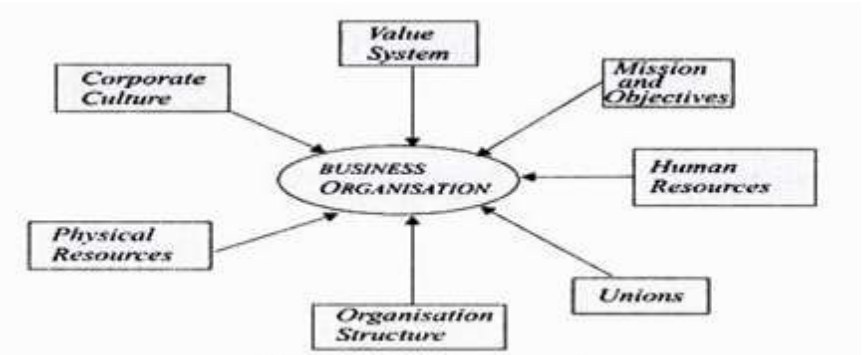


Fig. 1.4. Internal Environment

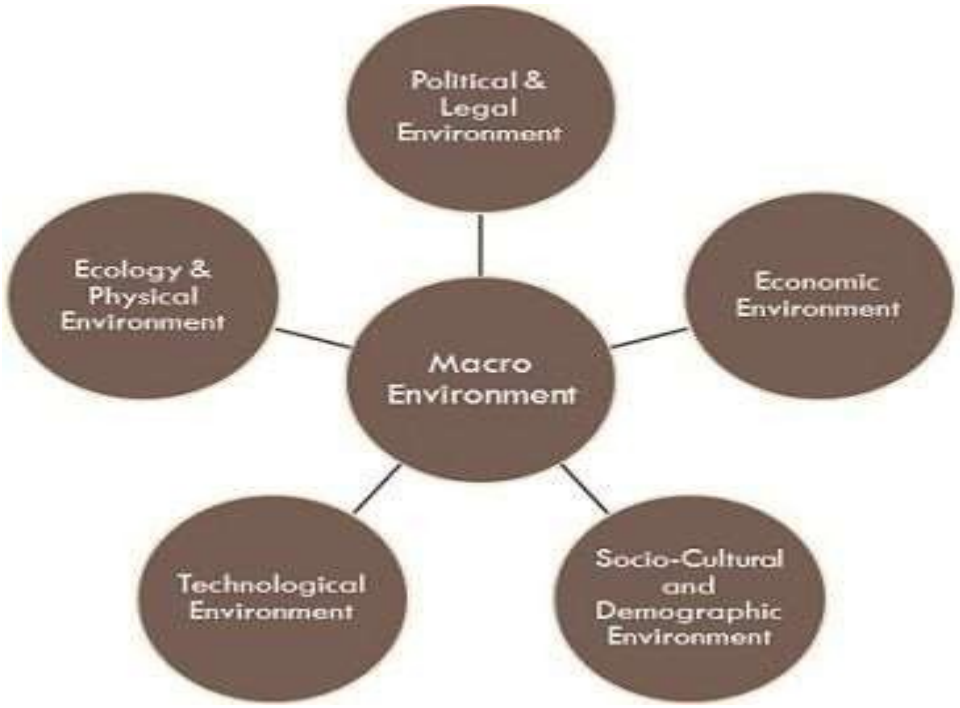
External Environment:
The external business environment consists of economic, political and legal, demographic, social, competitive, global, and technological sectors. Managers must understand how the environment is changing and the impact of those changes on the business.

Micro environment:
The factors or elements in a firm's immediate **environment** which affect its performance and decision-making; these elements include the firm's suppliers, competitors, marketing intermediaries, customers and publics.

Fig. 37.2 Constituents of business environment

Macro Environment:

The factors that make up the macro-environment are **economic factors**, demographic forces, **technological** factors, natural and physical forces, **political** and legal forces, and social and cultural forces.



The company is not alone in its business environment. It is surrounded by and operates in a larger context. This context is called the Macro Environment. It consists of all the forces that shape opportunities, but also pose threats to the company.

The Macro Environment consists of 6 different forces.
These are: **D**emographic, **E**conomic, **P**olitical, **E**cological, **S**ocio-Cultural, and **T**echnological forces. This can easily be remembered: the **DESTEP** model, also called DEPEST model, helps to consider the different factors of the Macro Environment.

Economic environment

- Employment/unemployment.
- Income.
- Inflation.
- Interest rates.
- Tax rates.
- Currency exchange rate.
- Saving rates.
- Consumer confidence levels.

The economic climate affects businesses in four main ways:

- unemployment.
- changing levels of consumer income.
- interest rates.
- tax rates.

Though the number and variety of the different resource, businesses requirement is limitless, economists divide the factors of production into three basic categories: **land**, **labour**, and **capital**.
Land refers to all of the **natural resources** that businesses need to make and distribute goods and services.
Labour refers to HR, HRM &HRP. It means the manpower requirement of an organisation.

Capital refers to fund and reserve. Capital asset indicates the economic growth of the organisation.

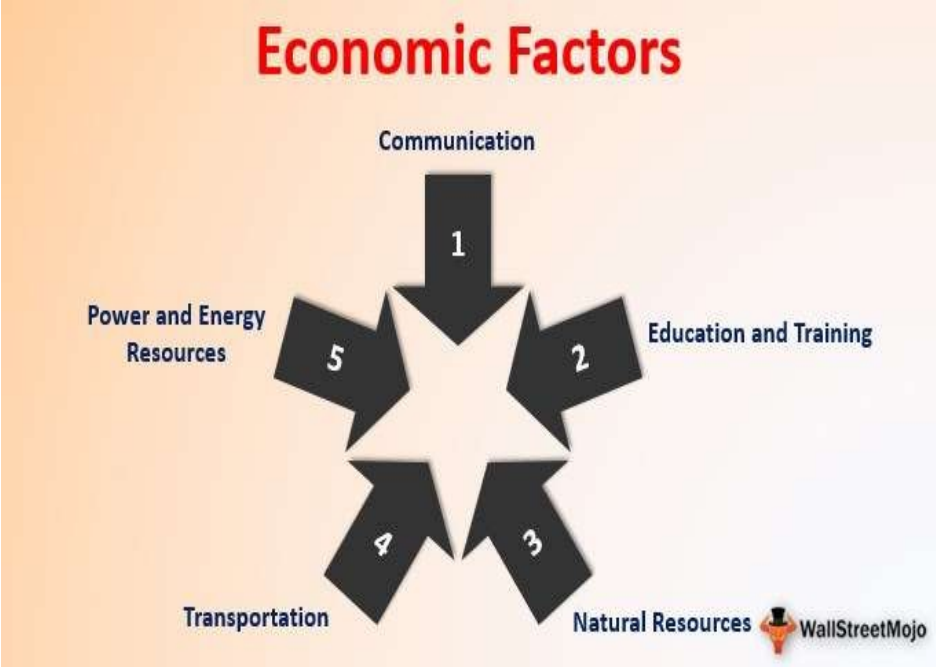
Macro factors include:

- Public and their needs and problems
- Employment/unemployment.
- Income.
- Inflation.
- Interest rates.
- Tax rates.
- Currency exchange rate.
- Saving rates.
- Consumer confidence levels.

There are multiple examples of economic factors some of them are as follows:-

- Tax Rate
- Exchange Rate
- Inflation
- Labour
- Demand/ Supply
- Wages
- Law and policies
- Governmental Activity

Recession: There are multiple examples of economic factors some of them are as follows:-



SWOT (strengths, weaknesses, opportunities, and threats) **analysis** is a framework used to evaluate a company's competitive position and to develop strategic planning. **SWOT analysis** assesses internal and external factors, as well as current and future potential.

SWOT analysis (or **SWOT matrix**) is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning.

This technique, which operates by 'peeling back layers of the company is designed for use in the preliminary stages of decision-making processes and can be used as a tool for evaluation of the strategic position of organizations of many kinds (for-profit enterprises, local and

national governments, NGOs, etc.). It is intended to specify the objectives of the business venture or project and identify the internal and external factors that are favourable and unfavourable to achieving those objectives. Users of a SWOT analysis often ask and answer questions to generate meaningful information for each category to make the tool useful and identify their competitive advantage. SWOT has been described as the tried-and-true tool of strategic analysis, but has also been criticized for its limitations.

SWOT analysis can be used to build organizational or personal strategy. Steps necessary to execute strategy-oriented analysis involve identification of internal and external factors (using the popular 2X2 matrix), selection and evaluation of the most important factors, and identification of relations existing between internal and external features.

For instance, strong relations between strengths and opportunities can suggest good conditions in the company and allow using an aggressive strategy. On the other hand, strong interactions between weaknesses and threats could be analysed as a potential warning and advice for using a defensive strategy.

ETOP analysis (environmental threat and opportunity profile) is the process by which organizations monitor their relevant environment to identify opportunities and threats affecting their business for the purpose of taking strategic decisions.

Environmental scanning is necessary because there are rapid changes taking place in the environment that has a great impact on the working of the business firm. Analysis of business environment helps to identify strength weakness, opportunities and threats.
The preparation of ETOP involves dividing the environment into different sectors and then analyzing the impact of each sector on the organization. A comprehensive ETOP requires sub dividing each environmental sector into sub-sectors and then the impact of each sector is described in the form of a statement.

1. Identification of strength:

Strength of the business firm means capacity of the firm to gain advantage over its competitors. Analysis of internal business environment helps to identify strength of the firm. After identifying the strength, the firm must try to consolidate or maximize its strength by further improvement in its existing plans, policies and resources.

2. Identification of weakness:

Weakness of the firm means limitations of the firm. Monitoring internal environment helps to identify not only the strength but also the weakness of the firm. A firm may be strong in certain areas but may be weak in some other areas. For further growth and expansion, the weakness should be identified so as to correct them as soon as possible.

3. Identification of opportunities:

Environmental analyses help to identify the opportunities in the market. The firm should make every possible effort to grab the opportunities as and when they come.

4. Identification of threat:

Business is subject to threat from competitors and various factors. Environmental analyses help them to identify threat from the external environment. Early identification of threat is always beneficial as it helps to diffuse off some threat.

5. Optimum use of resources:

Proper environmental assessment helps to make optimum utilization of scare human, natural and capital resources. Systematic analyses of business environment help the firm to reduce wastage and make optimum use of available resources, without understanding the internal and external environment resources cannot be used in an effective manner.

6. Survival and growth:

Systematic analyses of business environment help the firm to maximize their strength, minimize the weakness, grab the opportunities and diffuse threats. This enables the firm to survive and grow in the competitive business world.

7. To plan long-term business strategy:

A business organisation has short term and long-term objectives. Proper analyses of environmental factors help the business firm to frame plans and policies that could help in easy accomplishment of those organisational objectives. Without undertaking environmental scanning, the firm cannot develop a strategy for business success.

8. Environmental scanning aids decision-making:

Decision-making is a process of selecting the best alternative from among various available alternatives. An environmental analysis is an extremely important tool in understanding and decision making in all situation of the business. Success of the firm depends upon the precise decision- making ability. Study of environmental analyses enables the firm to select the best option for the success and growth of the firm.

ETOP stands for Environmental Threat and Opportunity Profile and **SAP** for Strategic Advantage Profile. ETOP discloses the most critical factors and their potential impact on a firm's strategy and operations, whereas **SAP** identifies specific advantages necessitating a firm's strategic actions.

The term "**strategic advantages**" refers to those market place **benefits** or **geographics** that exert a decisive influence on an organization's likelihood of future success. These **advantages** are quite sensitive and frequently changing by nature and are the sources of an organization's current and future competitive success relative to other providers of similar products.

The strategic managers should keep focus on the following dimensions,

1. Issue Selection:
Focus on issues, which have been selected, should not be missed since there is a likelihood of arriving at incorrect priorities. Some of the impotent issues may be those related to market share, competitive pricing, customer preferences, technological changes, economic policies, competitive trends, etc.

2. Accuracy of Data:
Data should be collected from good sources otherwise the entire process of environmental scanning may go waste. The relevance, importance, manageability, variability and low cost of data are some of the important factors, which must be kept in focus.

3. Impact Studies:
Impact studies should be conducted focusing on the various opportunities and threats and the critical issues selected. It may include study of probable effects on the company's strengths and weaknesses, operating and remote environment, competitive position, accomplishment of mission and vision etc. Efforts should be taken to make assessments more objective wherever possible.

4. Flexibility in Operations:
There are number of uncertainties exist in a business situation and so a company can be greatly benefited buy devising proactive and flexible strategies in their plans, structures, strategy etc. The optimum level of flexibility should be maintained.

Some of the key elements for increasing the flexibility are as follows:

(a) The strategy for flexibility must be stated to enable managers adopt it during unique situations.
(b) Strategies must be reviewed and changed if required.
(c) Exceptions to decided strategies must be handled beforehand. This would enable managers to violate strategies when it is necessary.
(d) Flexibility may be quite costly for an organization in terms of changes and compressed plans; however, it is equally important for companies to meet urgent challenges.

Environmental forecasting is a technique whereby managers attempt to predict the future characteristics of the organizational **environment** and hence make decisions today that will help the firm deal with the **environment** of tomorrow.

Forecasting is a technique that uses historical data as inputs to make informed estimates that are predictive in determining the direction of future trends. **Businesses** utilize **forecasting** to determine how to allocate their budgets or plan for anticipated expenses for an upcoming period of time.

Industrial Policy Resolution of 1956 (IPR 1956) is a resolution adopted by the Indian Parliament in April 1956. It was the first comprehensive statement on industrial development of India. The 1956 policy continued to constitute the basic economic policy for a long time. This fact has been confirmed in all the Five-Year Plans of India. According to this resolution the objective of the social and economic policy in India was the establishment of a socialistic

pattern of society. It provided more powers to the governmental machinery. It laid down three categories of industries which were more sharply defined. These categories were:

1. Schedule A: those industries which were to be an exclusive responsibility of the state.
2. Schedule B: those which were to be progressively state-owned and in which the state would generally set up new enterprises, but in which private enterprise would be expected only to supplement the effort of the state; and
3. Schedule C: all the remaining industries and their future development would, in general be left to the initiative and enterprise of the private sector.

Mc Kinsey 7s' model: Environmental scanning:

If something within the organization or team is not working, chances are there is inconsistency between some of the seven elements identified in the model. These are: strategy, structure, systems, shared values, style, staff, and skills.

The McKinsey 7S Model is a framework for organizational effectiveness that postulates that there are seven internal factors of an organization that need to be aligned and reinforced in order for it to be successful.

It can be used to identify which elements are required to be realigned in order to improve performance, or to maintain alignment and performance during other changes. These changes could include restructuring, new processes, an organizational merger, new systems, and change of leadership.

7 elements of the McKinsey 7s model.

Step 1: Identify areas that need to be aligned.

Step 2: Determine your optimal organizational design.

Step 3: Decide what needs to be changed.

Step 4: Implement the changes.

Step 5: Review the seven elements in your strategy development framework The

core values that define McKinsey can be summarized in three areas:

- adhere to the highest professional standards,
- improve our clients' performance significantly, and to
- create an unrivaled environment for exceptional people.

Porter's 5 force Model:

Porter's Five Forces is a framework for analyzing a company's competitive environment. The number and power of a company's competitive rivals, potential new market entrants, suppliers, customers, and substitute products influence a company's profitability.

Competition in the Industry:

The five forces refer to the number of competitors and their ability to undercut a company. The larger the number of competitors, along with the number of equivalent products and services they offer, the lesser the power of a company. Suppliers and buyers seek out a company's competition if they are able to offer a better deal or lower prices. Conversely, when competitive rivalry is low, a company has greater power to charge higher prices and set the terms of deals to achieve higher sales and profits. Potential of New Entrants Into an Industry

A company's power is also affected by the force of new entrants into its market. The less time and money it cost for a competitor to enter a company's market and be an effective competitor, the more an established company's position could be significantly weakened. An industry with strong barriers to entry is ideal for existing companies within that industry since the company would be able to charge higher prices and negotiate better terms.

Power of Suppliers

The next factor in the five forces model addresses how easily suppliers can drive up the cost of inputs. It is affected by the number of suppliers of key inputs of a good or service, how unique these inputs are, and how much it would cost a company to switch to another supplier. The fewer suppliers to an industry, the more a company would depend on a supplier. As a result, the supplier has more power and can drive up input costs and push for other advantages in trade. On the other hand, when there are many suppliers or low switching costs between rival suppliers, a company can keep its input costs lower and enhance its profits.

Power of Customers

The ability that customers have to drive prices lower or their level of power is one of the five forces. It is affected by how many buyers or customers a company has, how significant each customer is, and how much it would cost a company to find new customers or markets for its output. A smaller and more powerful client base means that each customer has more power to negotiate for lower prices and better deals. A company that has many, smaller, independent customers will have an easier time charging higher prices to increase profitability.

Threat of Substitutes:

The last of the five forces focuses on substitutes. Substitute goods or services that can be used in place of a company's products or services pose a threat. Companies that produce goods or services for which there are no close substitutes will have more power to increase prices and lock in favorable terms. When close substitutes are available, customers will have the option to forgo buying a company's product, and a company's power can be weakened.

Understanding Porter's Five Forces and how they apply to an industry, can enable a company to adjust its business strategy to better use its resources to generate higher earnings.

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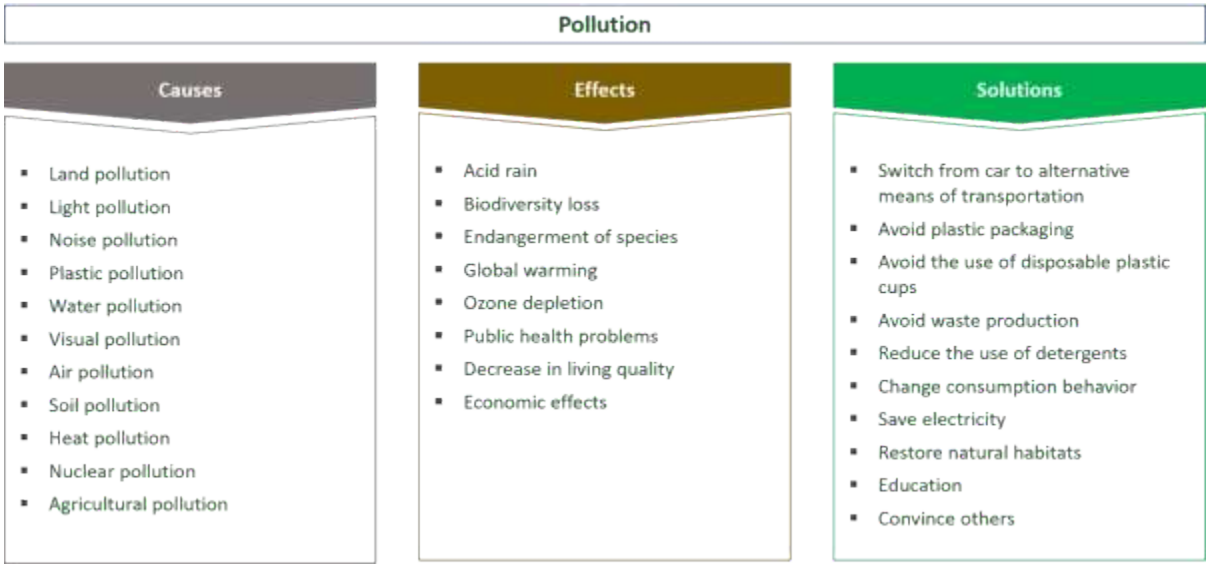

Water Pollution is the presence of harmful materials in water, such as sewage dissolved metal, waste from industries, factories and crude oil spilled from oil tankers. The three main substances that pollute water are nitrates from fertilizers, sewage and detergents.

Activities such as bathing and washing clothes near lakes, ponds or rivers add nutrients like nitrate and phosphate into the water bodies. This leads to excessive growth of algae on the surface of water. It blocks the penetration of sunlight and air, thus reducing oxygen.

It causes harm to organisms living in water and can also harm people's health. In extreme cases, it may cause diseases like cancer. It also leads to loss of a large amount of aquatic life.

Air can be polluted by many things. Examples include hazardous or poisonous gases, sulphur dioxide, nitrogen dioxide, carbon monoxide and very small particles. Smoke and harmful gases released by fires, industries, and thermal power plants cause air pollution. Using coal and wood as fuels for fire causes a lot of air pollution. Petroleum produces less pollution per ton, but it causes a lot of pollution since a lot of it is burned globally. Air pollution may cause health problems such as asthma or other breathing problems.

Air pollution causes global warming and acid rain. This makes it difficult for some living things to survive. *Air pollution* kills millions of people every year. We need clean and profitable solutions! The Solar Impulse Foundation is selecting innovative solutions to fight *air pollution*. For a sustainable world.

Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants.

Air pollution is a mixture of solid particles and gases in the air. Car emissions, chemicals from factories, dust, pollen and mould spores may be suspended as particles. Ozone, a gas, is a major part of air pollution in cities. When ozone forms air pollution, it's also called smog. Some air pollutants are poisonous. Air pollution refers to the release of pollutants into the air that are detrimental to human health and the planet as a whole. The Clean Air Act authorizes the U.S. Environmental Protection Agency (EPA) to protect public health by regulating the emissions of these harmful air pollutants. The NRDC has been a leading authority on this law since it was established in 1970.

CAUSES OF AIR POLLUTION:
“Most air pollution comes from energy use and production,” says John Walke, Director of the Clean Air Project, part of the Climate and Clean Energy Program at NRDC. “Burning fossil fuels releases gases and chemicals into the air.” And in an especially destructive feedback loop, air pollution not only contributes to climate change but is also exacerbated by it. “Air pollution

in the form of carbon dioxide and methane raises the earth's temperature," Walke says. "Another type of air pollution is then worsened by that increased heat: Smog forms when the weather is warmer and there's more ultraviolet radiation." Climate change also increases the production of allergenic air pollutants including mould, and pollen.

Effects of Air Pollution:

"While we've made progress over the last 40-plus years improving air quality in the U.S. thanks to the Clean Air Act, climate change will make it harder in the future to meet pollution standards, which are designed to protect health," says Kim Knowlton, senior scientist and deputy director of the NRDC Science Centre.

Smog and soot

These two are the most prevalent types of air pollution. Smog, or "ground-level ozone," as it is more wonkily called, occurs when emissions from combusting fossil fuels react with sunlight. Soot, or "particulate matter," is made up of tiny particles of chemicals, soil, smoke, dust, or allergens, in the form of gas or solids, that are carried in the air. The EPA's "Plain English Guide to the Clean Air Act" states, "In many parts of the United States, pollution has reduced the distance and clarity of what we see by 70 percent." The sources of smog and soot are similar. "Both come from cars and trucks, factories, power plants, incinerators, engines—anything that combusts fossil fuels such as coal, gas, or natural gas," Walke says. The tiniest airborne particles in soot—whether they're in the form of gas or solids—are especially dangerous because they can penetrate the lungs and bloodstream and worsen bronchitis, lead to heart attacks, and even hasten death.

Smog can irritate the eyes and throat and also damage the lungs—especially of people who work or exercise outside, children, and senior citizens. It's even worse for people who have asthma or allergies—these extra pollutants only intensify their symptoms and can trigger asthma attacks.

Hazardous air pollutants
These are either deadly or have severe health risks even in small amounts. Almost 200 are regulated by law; some of the most common are mercury, lead, dioxins, and benzene. “These are also most often emitted during gas or coal combustion, incinerating, or in the case of benzene, found in gasoline,” Walke says. Benzene, classified as a carcinogen by the EPA, can cause eye, skin, and lung irritation in the short term and blood disorders in the long term. Dioxins, more typically found in food but also present in small amounts in the air, can affect the liver in the short term and harm the immune, nervous, and endocrine systems, as well as reproductive functions. Lead in large amounts can damage children’s brains and kidneys, and even in small amounts it can affect children’s IQ and ability to learn. Mercury affects the central nervous system.

Polycyclic aromatic hydrocarbons, or PAHs, are toxic components of traffic exhaust and wildfire smoke. In large amounts, they have been linked to eye and lung irritation, blood and liver issues, and even cancer. In one recent study, the children of mothers who’d had higher PAH exposure during pregnancy had slower brain processing speeds and worse symptoms of ADHD.

Greenhouse gases:
By trapping the earth’s heat in the atmosphere, greenhouse gases lead to warmer temperatures and all the hallmarks of climate change: rising sea levels, more extreme weather, heat-related deaths, and increasing transmission of infectious diseases like Lyme. According to a 2014 EPA study, carbon dioxide was responsible for 81 percent of the country’s total greenhouse gas emissions, and methane made up 11 percent. “Carbon dioxide comes

from combusting fossil fuels, and methane comes from natural and industrial sources, including the large amounts that are released during oil and gas drilling," Walke says. "We emit far larger amounts of carbon dioxide, but methane is significantly more potent, so it's also very destructive." other class of greenhouse gases, hydrofluorocarbons (HFCs), are thousands of times more powerful than carbon dioxide in their ability to trap heat. In October 2016, more than 140 countries reached an agreement to reduce the use of these chemicals—which are used in air conditioners and refrigerators—and find greener alternatives over time. David Doniger, senior strategic director of NRDC's Climate and Clean Energy program, writes, "NRDC estimates that the agreed HFC phase-down will avoid the equivalent of more than 80 billion tons of CO_2 over the next 35 years."

Pollen and Mould:
Mould and allergens from trees, weeds, and grass are also carried in the air, are exacerbated by climate change, and can be hazardous to health. They are not regulated by the government and are less directly connected to human actions, but they can be considered air pollution. "When homes, schools, or businesses get water damage, Mould can grow and can produce allergenic airborne pollutants," Knowlton says. "Mould exposure can precipitate asthma attacks or an allergic response, and some Moulds can even produce toxins that would be dangerous for anyone to inhale."

Pollen allergies are worsening because of climate change. "Lab and field studies are showing that the more carbon dioxide pollen-producing plants—especially ragweed—are grown in, the bigger they grow and the more pollen they produce," Knowlton says. "Climate change also extends the pollen production season, and some studies are beginning to suggest that ragweed pollen itself might be becoming a more potent allergen." That means more people will suffer runny noses, fevers, itchy eyes, and other symptoms.

10 Serious Effects of Air Pollution on the Environment

- Global Warming.
- Climate Change.
- Acid Rain.
- Smog effect.
- Deterioration of fields.
- Extinction of animal species.
- Respiratory health problems.
- Deterioration in building materials.

Soil pollution or Soil contamination as part of land degradation is caused by the presence of xenobiotics (human-made) chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals or improper disposal of waste.

Illegal dumping of the solid wastes, polluted water absorbed by the soil, use of chemical fertilizers and pesticides, dumping of minerals, oils, and radioactive wastes are the major causes of soil pollution (Cachada et al. 2018).

The most common chemicals involved are petroleum hydrocarbons, polynuclear aromatic hydrocarbons (such as naphthalene and benzo(a)pyrene), solvents, pesticides, lead, and other heavy metals. Contamination is correlated with the degree of industrialization and intensity of chemical substance. The concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapour from the contaminants, or from secondary contamination of water supplies within and underlying the soil. Mapping of contaminated soil sites and the resulting clean-ups are time-consuming and expensive tasks, requiring extensive amounts of geology, hydrology, chemistry, computer modelling skills, and GIS in Environmental contamination, as well as an appreciation of the history of industrial chemistry.

Contaminated or polluted soil directly affects human health through direct contact with soil or via inhalation of soil contaminants which have vaporized; potentially greater threats are posed by the infiltration of soil contamination into groundwater aquifers used for human consumption, sometimes in areas apparently far removed from any apparent source of above ground contamination. This tends to result in the development of pollution -related diseases like neuromuscular blockage.

Ecosystem effect:

Soil contaminants can have significant deleterious consequences for ecosystems. There are radical soil chemistry changes which can arise from the presence of many hazardous chemicals even at low concentration of the contaminant species. The changes can manifest in the alteration of metabolism, of endemic microorganisms and arthropods resident in a given soil environment. The result can be virtual eradication of some of the primary food chain, which in turn could have major consequences for predators or consumer species. Even if the chemical effect on lower life forms is small, the lower pyramid levels of the food chain may ingest alien chemicals, which normally become more concentrated for each consuming rung of the food chain. Many of these effects are now well known, such as the concentration of persistent DDT materials for avian consumers, leading to weakening of egg shells, increased chick mortality and potential extinction of species.

Marine Pollution:

Marine pollution is a combination of chemicals and trash, most of which comes from land sources and is washed or blown into the ocean. This pollution results in damage to the environment, to the health of all organisms, and to economic structures worldwide. 5 - 8. Marine pollution occurs when harmful effects result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms. Eighty percent of marine pollution comes from land.

Causes of Marine Pollution:

- Here are some of the major causes of marine pollution:
- Nonpoint source pollution (Runoff)
- Oil spills.
- Littering.
- Ocean mining.
- Harmful to marine animals.
- A threat to human health.
- Reduce chemical fertilizer use.
- Skip for reusable bottles and utensils.

Effects of Marine Pollution:

The specific effects of ocean pollution on sea life include: Oil covering the feathers of birds and the gills of fish. Skin and eye irritation and lung and liver problems from oil deposits and by-products. Reproductive system failure from exposure to poisonous industrial and agricultural chemicals.

Every day, toxic chemicals are entering our oceans. If humans are exposed to these toxic chemicals for long periods of time, then this can result in dangerous health problems, which include hormonal issues, reproductive issues, and damage to our nervous systems and kidneys.

Types of pollution affect Marine Pollution:

Marine pollution encompasses many types of pollution that disrupt the marine ecosystem, including chemical, light, noise, and plastic pollution.

(There are many ways to categorize and examine the inputs of pollution into marine ecosystems. Patin (n.d.) notes that generally there are three main types of inputs of pollution into the ocean: direct discharge of waste into the oceans, runoff into the waters due to rain, and pollutants released from the atmosphere.)

Marine pollution occurs when harmful effects result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of hostile organism. Eighty percent of marine pollution comes from land. Air pollution also a contributes factor by carrying off iron, carbonic acid, nitrogen, silicon, sulphur, pesticides or dust particles into the ocean. Land and air pollution have proven to be harmful to marine life and its habitats.

The pollution often comes from nonpoint sources such as agricultural runoff, wind- blown remains, and dust. Pollution in large bodies of water can be aggravated by physical phenomena like the biological effects of Langmuir circulation. Nutrient pollution, a form of water pollution, refers to contamination by excessive inputs of nutrients.

It is a primary cause of eutrophication of surface waters, in which excess nutrients, usually nitrates or phosphates, stimulate algae growth. Many potentially toxic chemicals adhere to tiny particles which are then taken up by plankton and benthic animals, most of which are either deposits feeders or filter feeders. The toxins are concentrated upward within ocean food chains. Many particles combine chemically in a manner highly depletive of oxygen, causing estuaries to become anoxic.

When pesticides are incorporated into the marine ecosystem, they quickly become absorbed into marine food webs. Once in the food webs, these pesticides can cause mutations, as well as diseases, which can be harmful to humans as well as the entire food web. Toxic metals can also be introduced into marine food webs. These can cause a change to tissue matter, biochemistry, behaviour, reproduction, and suppress growth in marine life. Many animal feeds have a high fish meal or fish hydrolysate content. In this way, marine toxins can be transferred to land animals, and appear later in meat and dairy products.

Noise pollution:

Noise pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms. According to the World Health Organization, sound levels less than 70 dB are not damaging to living organisms, regardless of how long or consistent the exposure is.

Noise pollution is considered to be any unwanted or disturbing sound that affects the health and well-being of humans and other organisms. Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. These health problems can affect all age groups, especially children.

CAUSES OF NOISE POLLUTION

- Traffic noise.
- Air traffic noise.
- Construction sites.
- Catering and night life.
- Animals.
- Physical.
- Psychological.
- Sleep and behavioural disorders.

High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery diseases. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss. A substantial amount of the noise that humans produce occurs in the ocean. Recently, most research on noise impacts has been focused on marine mammals, and to a lesser degree, fish. In the past few years, scientists have shifted to conducting studies on invertebrates and their responses to anthropogenic sounds in the marine environment. This research is essential, especially considering that invertebrates make up 75% of marine species, and thus compose a large percentage of ocean food webs. Of the studies that have been conducted, a sizable variety in families of invertebrates have been represented in the research. A variation in the complexity of their sensory systems exists, which allows scientists to study a range of characteristics and develop a better understanding of anthropogenic noise impacts on living organisms.

Diseases due to Noise Pollution:

The most common health problem it causes is Noise Induced Hearing Loss (NIHL). Exposure to loud noise can cause:

- high blood pressure,
- heart disease,
- sleep disturbances, and
- stress. These health problems can affect all age groups.

Nuclear hazards:
Nuclear hazards are threat posed by the invisible and odourless contamination of the environment by the presence of radioactive materials such as radio-nuclides in air water or soil. These radio-nuclides emit high energy particles (alpha and beta rays) and electromagnetic radiations (gamma rays). Risk or danger to human health or the environment exposed by the radiation emanating from the atomic nuclei is called as nuclear hazard. It is an actual or potential release of radioactive material at a commercial nuclear power plant or a transportation accident. Causes / sources.
Causes of Radioactive Pollution

- Nuclear Accidents from Nuclear Energy Generation Plants.
- The Use of Nuclear Weapons as Weapons of Mass Destruction (WMD)
- Use of Radioisotopes.
- Mining.
- Spillage of Radioactive Chemicals.
- Tests on Radiation.
- Cosmic Rays and Other Natural Sources.
- Nuclear Waste Handling and Disposal.

Diseases caused due to Nuclear Hazard:
Cancer induction is the most significant long-term risk of exposure to a nuclear bomb. Approximately 1 out of every 80 people exposed to 1 Gray will die from cancer, in addition to the normal rate of 20 out of 80. About 1 in 40 people will get cancer, in addition to the typical rates of 16-20 out of 40. It causes acute health effects such as skin burns and acute radiation syndrome (“radiation sickness"). It can also result in long-term health effects such as cancer and cardiovascular disease.

Industrial Waste pollution:

Waste water from manufacturing or chemical processes in industries contributes to water pollution. Industrial waste water usually contains specific and readily identifiable chemical compounds. Water pollution is concentrated within a few subsectors, mainly in the form of toxic wastes and organic pollutants.

Characterizing the Different Types of Industrial Waste

- Chemical Waste. Chemical waste is typically generated by factories, processing centres, warehouses, and plants.
- Solid Waste. In industrial services, solid waste includes a variety of different materials, including paper, cardboard, plastics, packaging materials, wood, and scrap metal.
- Toxic and Hazardous Waste.

Causes of Industrial Waste

- Lack of Policies to Control Pollution.
- Unplanned Industrial Growth.
- Use **Industrial Waste Pollution:** of Outdated Technologies.
- Presence of a Large Number of Small -Scale Industries.
- Inefficient Waste Disposal.
- Leaching of Resources from Our Natural World.
- Natural Resource Use.

Effect of Industrial Waste Pollution:

Industrial waste may be solid, semi-solid or liquid in form. It may be hazardous waste (some types of which are toxic) or non-hazardous waste. Industrial waste may pollute the nearby soil or adjacent water bodies, and can contaminate groundwater, lakes, streams, rivers or coastal waters. Exposure to hazardous waste can affect human health, children being more vulnerable to these pollutants. Waste from agriculture and industries can also cause serious health risks. Other than this, co-disposal of industrial hazardous waste with municipal waste can expose people to chemical and radioactive hazards.

How To Reduce Industrial Waste:

1. Measure Your Waste.
2. Be a More Efficient Business.
3. Consider a Waste Exchange.
4. Reduce the Amount of Packaging.
5. Think About Food Waste.
6. Cut Down on Bottled Water
7. Use Signs.
8. Hire a Professional Waste Management Business.

DISASTER:

A ***disaster*** is a sudden, calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins.

A disaster is a serious disruption occurring over a short or long period of time that causes widespread human, material, economic or environmental loss which exceeds the ability of the affected community or society to cope using its own resources.

There are two types of disaster: (natural and man-made.)

1. Natural Disaster: A disaster caused by natural factors called as a natural disaster e.g., earthquake, flood, cyclone etc.
2. Man-made disaster: A disaster caused due to the human activities e.g., wars, fire accidents, industrial accidents etc.

Disaster Management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular, preparedness, response and recovery in order to lessen the impact of disasters. Disasters are the consequences of natural or human hazards.

Disaster management efforts aim to reduce or avoid the potential losses from hazards, assure prompt and appropriate assistance to the victims of a disaster, and achieve a rapid and effective recovery. It is crucial that hospitals remain safe and functional during and after disasters.

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These common elements allow you to prepare for and protect yourself and your animals from disaster. Emergency managers think of disasters as recurring events with four phases: Mitigation, Preparedness, Response, and Recovery.

The Top 20 Biggest Man-Made Disasters

1. The Bhopal Gas Leak. The victims of the gas leak.
2. The Jilin Chemical Explosion. The toxic cloud from the explosion.
3. The Tennesse Coal Ash Spill. A house in Kingston buried in the ash.
4. The Sidoarjo mud volcano.
5. The North Pacific Garbage Patch.
6. The Gulf War Spill.
7. The Deepwater Horizon Oil Spill.
8. The Exxon Valdez Oil Spill.
9. Volcanic eruption

4 benefits of disaster recovery planning:

- Cost-Efficiency. Disaster recovery plans have multiple components.
- Increased Employee Productivity. A disaster recovery plan will have to be executed by the right people.
- Greater Customer Retention.
- A Better Understanding of

Scalability. Measures to prevent hazards:

- Prevention,
- Mitigation,

- Preparedness,
- Response and
- Recovery are the five steps of Emergency Management.

Components of Disaster Risk management.

- Mitigation / Measures to be taken before and after an event.
- Preparedness / Measures to be taken before and after an event.
- Response / Measures to be taken during and immediately after an event.
- Recovery / Post disaster measures (long term after the disaster).

Some examples of social factors that affect retail businesses include:

- Acceptance of internet commerce.
- Advertising preferences.
- Age distribution.
- Buying habits.
- Comfort with technology.
- Customer service expectations.
- Disposable income levels.
- Education level.

Most acute Contemporary social issues:

Abortion,
World poverty,
Animal rights,
Immigration,
Physician-assisted suicide,
Freedom of religion,
Hate speech, cloning,
Income inequality,
Pornography,
Gun rights,
Racial profiling,
Capital punishment,
Overpopulation,
Prostitution,
Drug legalization,
Cruelty and torture.

MOD 3:

Introduction to Business Ethics:

'Business Ethics' can be termed as a study of proper business policies and practices regarding potentially controversial issues, such as corporate governance, insider trading, bribery, discrimination, corporate social responsibility, and fiduciary responsibilities.

Businesses must abide by some basic principles. It should provide quality goods and services at reasonable prices to their consumers. It must also avoid adulteration, misleading advertisements, and other unfair malpractices.

Definition:

According to Crane, "Business ethics is the study of business situations, activities, and decisions where issues of right and wrong are addressed."

Baumhart defines, "The ethics of business is the ethics of responsibility. The business man must promise that he will not harm knowingly."

Features of Business Ethics

There are eight major features of business ethics −

- **Code of Conduct** − Business ethics is actually a form of codes of conduct. It lets us know what to do and what not to do. Businesses must follow this code of conduct.
- **Based on Moral and Social Values** − Business ethics is a subject that is based on moral and social values. It offers some moral and social principles (rules) for conducting a business.
- **Protection to Social Groups** − Business ethics protect various social groups including consumers, employees, small businesspersons, government, shareholders, creditors, etc.
- **Offers a Basic Framework** − Business ethics is the basic framework for doing business properly. It constructs the social, cultural, legal, economic, and other limits in which a business must operate.
- **Voluntary** − Business ethics is meant to be voluntary. It should be self-practiced and must not be enforced by law.
- **Requires Education & Guidance** − Businessmen should get proper education and guidance about business ethics. Trade Associations and Chambers of Commerce should be active enough in this matter.
- **Relative Term** − Business ethics is a relative term. It changes from one business to another and from one country to another.
- **New Concept** − Business ethics is a relatively newer concept. Developed countries have more exposure to business ethics, while poor and developing countries are relatively backward in applying the principles of business ethics.

Nature of Business Ethics:

The nature of business ethics refers to the standard characteristics of human behaviour in its definition as its core concept. It has moral and social norms for doing business. This

includes self-control, consumer protection, and welfare, community service, fair treatment of social groups, exploitation of others, etc. Business ethics is known as the nature of business ethics. It deals with the corporate sector in various points related to their ethics of business.

Scopes of Business Ethics:

"Business ethics (also corporate ethics) is a form of applied ethics or professional ethics that examines ethical principles and moral or ethical problems that arise in a business environment. It applies to all aspects of business conduct and is relevant to the conduct of individuals and entire organizations."

Business ethics is based on moral and social values. It contains moral and social principles (rules) for doing business. It provides basic framework for doing business. It gives the social cultural, economic, legal and other limits of business.

Business Ethics for Executives

- Honesty.
- Integrity.
- Promise-Keeping & Trustworthiness.
- Loyalty.
- Fairness.
- Concern for Others.
- Respect for Others.
- Law Abiding.

Objectives of Business Ethics:

The Objectives of Ethics are to evaluate the human behaviours and calling up on the moral standards. The ethical standards also prescribe how to act morally in specified situations.

The objectives of the study on Professional Ethics may be listed as:

1. Improvement of the cognitive skills (skills of the intellect in thinking clearly)
2. Moral awareness (proficiency in recognizing moral problems in engineering)
3. Cogent moral reasoning (comprehending, assessing different views).

Factors influencing Business Ethics:

1. Personal Code of Ethics

A man's personal code of ethics that is what one considers moral is the foremost responsible factor influencing his behaviour.

2. Legislation

It is already stated that the Government will intervene and enact laws only when the businessmen become too unethical and selfish and totally ignore their responsibility to the society. No society can tolerate such misbehaviour continuously. It will certainly exert pressure on the Government and the Government consequently has no other alternative to prohibit such unhealthy behaviour of the businessmen.

3. Government Rules and Regulations
Laws support Government regulations regarding the working conditions, product safety, statutory warning etc. These provide some guidelines to the business managers in determining what are acceptable or recognized standards and practices.

4. Ethical Code of the Company
When a company grows larger, its standard of ethical conduct tends to rise. Any unethical behaviour or conduct on the part of the company shall endanger its established reputation, public image and goodwill. Hence, most companies are very cautious in this respect. They issue specific guidelines to their subordinates regarding the dealings of the company.

5. Social Pressures
Social forces and pressures have considerable influence on ethics in business. If a company supplies sub-standard products and get involved in unethical conducts, the consumers will become indifferent towards the company. Such refusals shall exert a pressure on the company to act honestly and adhere strictly to the Business Ethics. Sometimes, the society itself may turn against a company.

6. Ethical Climate of the Industry
Modern industry today is working in a more and more competitive atmosphere. Hence only those firms, which strictly adhere to the ethical code, can retain its position unaffected in its line of business. When other firms, in the same industry are strictly adhering to the ethical standards, the firm in question should also perform up to the level of others. If the company's performance is below than other companies, in the same industry, it cannot survive in the field in the long run.

Ethics in Marketing:

Ethical marketing refers to the process by which companies market their goods and services by focusing not only on how their products benefit customers, but also how they benefit socially responsible or environmental causes. To put this another way, ethical marketing isn't a strategy; Marketing ethics is an area of applied ethics which deals with the moral principles behind the operation and regulation of marketing. Some areas of marketing ethics (ethics of advertising and promotion) overlap with media and public relations ethics.

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Ethics in Finance:

Ethical dilemmas and ethical violations in finance can be attributed to an inconsistency in the conceptual framework of modern financial-economic theory and the widespread use of a principal-agent model of relationship in financial transactions. The financial-economic theory that underlies the modern capitalist system is based on the rational-maximizer paradigm, which holds that individuals are self-seeking (egoistic) and that they behave rationally when they seek to maximize their own interests.

The principal-agent model of relationships refers to an arrangement whereby one party, acting as an agent for another, carries out certain functions on behalf of that other. Such arrangements are an integral part of the modern economic and financial system, and it is difficult to imagine it functioning without them.

The behavioral assumption of the modern financial-economic theory runs counter to the ideas of trustworthiness, loyalty, fidelity, stewardship, and concern for others that underlie the traditional principal-agent relationship. The traditional concept of agency is based on moral values. However, if human beings are rational maximizers, then agency on behalf of others in the traditional sense is impossible.

The ethical dilemma presented by the problem of conflicting interests has been addressed in some areas of finance, such as corporate governance, by converting the agency relationship into a purely contractual relationship that uses a carrot-and-stick approach to ensure ethical behavior by agents. In corporate governance, the problem of conflict between management (agent) and stockholders (principal) is described as an agency problem.

Economists have developed an agency theory to deal with this problem. The agency theory assumes that both the agent and the principal are self-interested and aim to maximize their gain in their relationship. A simple example would be the case of a store manager acting as an agent for the owner of the store. The store manager wants as much pay as possible for as little work as possible, and the store owner wants as much work from the manager for as little pay as possible.

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Most of the needs for financial services-management of retirement savings, stock and bond investing, and protection against unforeseen events, to name a few are such that they are better entrusted to others because no one is having neither the ability nor the time to carry and watch out the investment part effectively.

The corporate device of contractualization of the agency relationship is, however, too difficult to be applied to the multitude of financial dealings between individuals and institutions that take place in the financial market every day. Individuals are not as well organized as stockholders, and they are often unaware of the agency problem.

Lack of information also limits their ability to monitor an agent's behaviour. Therefore, what we have in our complex modern economic system is a paradoxical situation: the ever-increasing need for getting things done by others on the one hand, and the description of human nature that emphasizes selfish behaviour on the other. This paradoxical situation, or the inconsistency in the foundation of the modern capitalist system, can explain most of the ethical problems and declining morality in the modern business and finance arena.

Finance is defined as the management of money and includes activities such as

- investing,
- borrowing,
- lending,
- budgeting,
- saving,
- and forecasting.

This guide provides an overview of how public finances are managed, what the various components of public finance are governed.

Financial Management is the study of ways in which managers obtain funds, manage working capital, and allocate funds to long-term investments.

Finance is comprised of 3 interrelated major areas: (1) money and capital markets, which deals with securities markets and financial institutions; (2) investments, which focuses on the decisions made by both individual and institutional investors as they choose securities for their investment portfolios; and (3) managing working capital.

The reasons:

To Generate Money

- To start a business, money or funds is the primary criteria. It is obvious that to make the first step and launch business, capital investment is required. Further, as the timeline moves up, getting materials, hiring professionals, marketing and testing, every single step would need financial management.

To Organize Operations

- Businesses generate enormous amounts of money every day. This money has to be used further to pay bills, delegate funds, invest in multiple engagements and monitor all. Managing the inflow and outflow of money within the organization and outside is a vital decision. Failing the above, it becomes tough to allocate funds efficiently and effectively. Not to forget that irregular flow of money can turn a business insolvent.

To Manage Cash Flow

- Having excessive funds is as fatal as having lesser ones. For an organization to be carried on day- to- day processing, it becomes imperative to manage the cash flow. In case anyone has higher funds and is not using it as needed, it signifies wastage of resources. For an enterprise that has surplus cash, putting them to use and investing in significant engagements would yield better returns and help them in expanding the business.

To Strategize Funding

- When business want to allocate funds and use it to map the expenses that take place on a regular basis. However, spending any or every cash without proper planning is not wise. It is required to keep track of the expenses, monitor the frequency and then decide how to spend and how much to spend. At times, it is important to cut down extra costs and reduce expenses. This can only be done when management of finance undertakings effectively. It is advocated that companies must have sufficient funds to deal with situations of monetary crisis.

To Outline Long Term Goals

- Organizations work to grow and scale their business high. To do so, it is important to have significant future goals that the organization aims to accomplish in a span of five or ten years. Financial Management helps an organization to achieve its goals without fail. Consider that any business organisation has planned to expand to different three new cities. While actually implementing the plan, the management runs out of money. This wouldn't have happened had the decision managed the organization's finance and then executed. Pre-planning and working on the available cash of the organization helps to figure out the future possibilities of crisis while moving ahead to attain the organisational goal.

To Sustain Economic Downturn

If look at the growth graph of an organization, one will never find that the growth line rises straight or is without any bends. The growth of the cycle of business organization is a mix and merge of highs and lows which of course could be due to various reasons. Recession, depression, boom or failure, all add up to the fall of a business. With sufficient finance and significant financial management, it becomes easier for the organization to walk down the business cycle. No matter how bad the situation is, they are always ready to face the problem and bear the consequences without being under the threat of shutting down. Failure-proof financial management plans help the organization thrive even know adverse economic conditions.

Corporate/ business finance is an important and inevitable function in any business and efficient financial management is crucial for success and sustenance since it involves the management of financial resources and financial activities of the organization.

A team of finance and accounting professionals or the finance department generally handles it. Financial analytics is a chapter available to help gain a deep understanding of advanced concepts in the areas of accounts and finance, and to keep themselves abreast of changing trends, mechanisms and legislation.

Initial Capital:

It is popularly said that money is essential for making money. To start the activities of a business, capital investment is required. For ideas to materialize and become products/ services, the groundwork for sales, product testing, marketing, etc. seed capital is essential. Businesses have a tough but defining choice between debt and equity financing.

Meeting operational expenses:

In the short-term, businesses require finance in the form of working capital to meet operational expenses such as remunerative payments, raw materials, inventory, interest payments, etc. Proper short-term financial planning and maintenance of good working capital flow is crucial to keep the operations going. Though maintain adequate cash flow is always important, it is especially important in the starting stages since revenues will take some time to match the cash outflows.

Scaling up and asset creation:

In the long-term, capital is crucial for purchasing assets like machinery, land, equipment, etc. to expand the production scale. Scaling up production will create assets, help the business grow and penetrate existing markets. The business must have sufficient capital budget to do so and cannot depend on short-term finances for this. They must have savings and should be able to raise and infuse capital investment through debt or equity financing.

New products and markets:

Without finance and proper financial management, even an established organization will not be able to explore newer markets or develop and test newer solutions/ products. Finance is required for testing and research purposes as well as for marketing and advertising purposes.

Business cycles:

Business cycles of growth, boom, recession, depression and renewal caused by changes in the economy and other external factors are a reality. And no matter how well it is doing, the business is bound to bear the consequences and has to be prepared to tackle these cycles. The financial plans must be foolproof and should include plans for when the business takes a hit due economic downturn.

The business cycle, also known as the economic cycle or trade cycle, are the fluctuations of gross domestic product around its long-term growth trend. The length of a business cycle is the period of time containing a single boom and contraction in sequence.

Business cycles are usually measured by considering the growth rate of real gross domestic product. Despite the often-applied term cycles, these fluctuations in economic activity do not exhibit uniform or predictable periodicity. The common or popular usage boom-and-bust cycle refers to fluctuations in which the expansion is rapid and the contraction severe.

The current view of mainstream economics is that business cycles are essentially the summation of purely random shocks to the economy and thus are not, in fact, cycles, despite appearing to be so. However, certain heterodox schools propose alternative theories suggesting that cycles do in fact exist due to endogenous causes.

Ethics aims at controlling and handling all finance issue faced by companies and employees. The various ethical issues included are accounting related like window dressing and improper window dressing, insider trading, fake reimbursements, overbilling, bribery, kickbacks etc.

The role of ethics in financial management is to balance, protect and preserve stakeholders' interests. Eli Lilly and Company, for example, says its code of ethics in finance covers obligations to management, fellow employees, business partners, the public and shareholders.

The Ethics code ensures that all members of the company demonstrate integrity and honesty in their work with clients and other professional relationships. The ethics code also prevents

accountants from associating themselves with any information that could be misleading or damaging to the client or the organisation.

General ethical norms encompass truthfulness, honesty, integrity, respect for others, fairness, and justice. This relates to all aspects of life, including business and finance. Financial ethics is, therefore, a subset of general ethics.

Ethics in general is concerned with human behavior that is acceptable or "right" and that is not acceptable or "wrong" based on conventional morality. General ethical norms encompass truthfulness, honesty, integrity, respect for others, fairness, and justice. They relate to all aspects of life, including business and finance. Financial ethics is, therefore, a subset of general ethics.

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The behavioral assumption of the modern financial-economic theory runs counter to the ideas of trustworthiness, loyalty, fidelity, stewardship, and concern for others that underlie the traditional principal-agent relationship. The traditional concept of agency is based on moral values. However, if human beings are rational maximizers, then agency on behalf of others in the traditional sense is impossible. As Duska (1992) explains it: "To do something for another in a system geared to maximize self-interest is foolish. Such an answer, though, points out an inconsistency at the heart of the system, for a system that has rules requiring agents to look out for others while encouraging individuals to look out only for themselves, destroys the practice of looking out for others"

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"The job of agency theory is to help devise techniques for describing the conflict inherent in the principal-agent relationship and controlling the situations so that the agent, acting from self-interest, does as little harm as possible to the principal's interest" (DeGeorge, 1992). The agency theory turns the traditional concept of agency relationship into a structured (contractual) relationship in which the principal can influence the actions of agents through incentives, motivations, and punishment schemes. The principal essentially uses monetary rewards, punishments, and the agency laws to command loyalty from the agent.

Ethical Concerns in Financial Reporting and Analysis

- Financial Reporting and Analysis:

Faking the Numbers. The most common ethical concern within reporting and analysis is "faking the numbers or figures".

- Asset Misappropriation.
- Disclosure Concerns.
- Executive Focusing.
- No Direct Chain of Command.
- The Overview.

Accounting ethics refers to following specific rules and guidelines set by governing bodies that every person associated with accounting should follow to prevent misuse of the financial information or their management position.

BCG matrix

GE Matrix

High ethical standards are critical to maintaining the public's trust in financial markets and in the investment profession.

The Code of Ethics maintains that investment professionals must place the integrity of the profession and the interests of clients above their own, and act with competence and respect. High ethical standards are critical to maintaining the public's trust in financial markets and in the investment profession.

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Purpose of ethics in finance and accounting.

The purpose of financial accounting ethics is to ensure that certified public accountants (CPAs) conduct their duties objectively and with integrity. Financial accounting ethics form the basis for legal and regulatory requirements and include issues related to maintaining public trust.

Integrity requires accountants to be honest, candid and forthright with a client's financial information. Accountants should restrict themselves from personal gain or advantage using confidential information.

These ethics and conduct rules ensure all accountants act in a consistent manner.

Four standards of ethical conduct in management accountants' professional activities were developed by the Institute of Management Accountants. The four standards are competence, confidentiality, integrity, and credibility.

The major ethical issues that have to be deal by the human resource management are a concern with the privacy issues, cash and compensation plan, employment issues, safety issues, race and disability, performance appraisal and employee's responsibility.

Major Issues in Ethical Management

- Harming some while benefitting others. HR managers do much of the screening while the hiring process is still on.
- Equal Opportunity.
- Privacy.
- Compensation and Skills.
- Labour Costs.
- Opportunity for New Skills.
- Fair Hiring and Justified Termination.
- Fair Working Conditions.

Human Resource Management (HRM) deals with work force management, manpower planning and other employee related activities in an organization. HRM concerns human issues, especially those related with compensation, development, industrial relations, health and safety issues As human resource professionals, ethically responsible for promoting and fostering fairness and justice for all employees and their organizations. To create and sustain an environment that encourages all individuals and the organization to reach their fullest potential in a positive and productive manner.

Employee ethics are a set of principles that forms the rules of conduct for a group of people, such as a business. Ethics focus on day-to-day behavior and decision making. Employee ethics apply to people at all levels of the organization and help to determine the success of the organization.

HR directs the flow of people in and out of the organization. They direct the onboarding process, and they facilitate the ongoing education of all employees. Their fingerprint is all over the people that make up the organization. Accountability is keeping your commitments to people.

HR managers can help to ensure that organisations operate with due concern for fairness, integrity and justice both to reduce the likelihood of ethical conflicts arising and in dealing with them in the event that they do.

HR professionals help lay out the expectations for employees by developing written standards of ethical workplace conduct, providing training to make sure everyone is aware of the expectations and equipping managers to reinforce the company's values through their actions.

People are an organisation's most valuable resource. They need to feel valued in order to develop their talents, increase their productivity and choose to remain in an organisation. Ethics in HR ensures that with structures like L&D and retention efforts in place, an organisation will meet its employees' expectations.

Today's Top 10 Human Resource Management Challenges

- Change management. 48%
- Leadership development. 35%
- HR effectiveness measurement. 27%
- Organizational effectiveness. 25%
- Compensation. 24%
- Staffing: Recruitment and availability of skilled local labor. 24%
- Succession planning. 20%
- Learning and development. 19%

Workplace ethics ensures positive ambience at the workplace. Workplace ethics leads to happy and satisfied employees who enjoy coming to work rather than treating it as a mere source of burden. Employees also develop a feeling of loyalty and attachment towards the organization.

Organizations need to have fool-proof systems to measure the performances of individuals. Appraisal system needs to be designed keeping in mind employee’s performance throughout the year and his/her career growth. Periodic reviews are essential. It is mandatory for superiors to know what their subordinates are up to. You need to know who all are going on the right track and who all need that extra push. Workplace ethics ensures management guides and mentors their employees well. Appraisal and salary hikes should not happen just for the name’s sake. Workplace ethics is important as it enables management to treat all employees as equal and think from their perspective as well. Employees must have a say in their appraisal system. Transparency is essential.

How to Address Ethical Issues in the Workplace

1. Introduce a Policy. Most large companies enforce codes of ethics that clearly state the definition of, and the punishment for, employee misconduct.
2. Provide Resources and Education.
3. Employ a Confidential System.
4. Be Consistent.

Improving Ethics in the Workplace

1. Create a code.
2. Engage with your employees and customers.

3. Reinforce the benefits of the code.
4. Be a good role model.
5. Train your employees.
6. Promote your ethical behaviour.
7. Reward ethical behaviour.
8. Learn from your mistakes.

Ethics in Decision making:

Ethical decision-making refers to the process of evaluating and choosing among alternatives in a manner consistent with ethical principles. In making ethical decisions, it is necessary to perceive and eliminate unethical options and select the best ethical alternative.

Most ethical decisions have:

(a) multiple alternatives;
(b) consequences that extend beyond the immediate situation;
(c) uncertain consequences;
(d) outcomes that mix various economic, legal, and social benefits and costs; and
(e) personal implications. A large portion of the study of ethics deals with the approach or source of the principles or standards to be used for ethical decision making in business.

Ethical decision making will be reserved for use in a group decision making context. Specifically, this address ethical decision making in business as providing the guiding requirements or goals for right conduct. These requirements often come as the result of organizational definition, agreement, or long-standing custom. There is clear recognition that ultimately a personal choice must be made with respect to right conduct, but business ethics will provide the assessment framework for correct behavior in the business organization.

A number of schools of thought have developed that include the following approaches (in no specific order):

- Utilitarian (on concept of utility maximization)
- Moral rights
- Universalist (ultimate benefit of mankind)
- Cost-benefit (cost minimisation without hampering quality)
- Fairness or justice
- Common good
- Virtue
- Deontological (based on moral obligation)
- Teleological (focus on end result)
- Contextualist (Based on facts and context)
- Principle-based
- As well for others

Four principles of Ethical Decision Making:

- Autonomy,
- Beneficence,
- Non-maleficence, and
- Justice

Three Frameworks:

Based upon the three-part division of traditional normative ethical theories discussed above, it makes sense to suggest three broad frameworks to guide ethical decision making:

The Consequentialist Framework

In the Consequentialist framework it is focused on the future effects of the possible courses of action, considering the people who will be directly or indirectly affected and asked about what outcomes are desirable in a given situation by considering ethical conduct to be achieved the best consequences.

The Duty Framework

In the duty framework ethical conduct is defined by doing one's **duties** and doing the right thing, and the goal is performing the correct action.

and

The Virtue Framework

In the Virtue framework, it is tried to identify the character traits (either positive or negative) that might motivate us in a given situation. It defines ethical behaviour as whatever a virtuous person would do in the situation, and we seek to develop similar virtues.

Steps of ethical Decision Making:
1 - Gather the facts. (Don't jump to conclusions without knowing the facts).
2 – Define the ethical issue(s)
3 – Identify the affected parties.
4 – Identify the consequences.
5 – Identify the relevant principles,
6 – Consider the organisational character
7 – Think creatively about potential.
8 – Check confidence and take decision

Consequences:
Think about potential positive and negative consequences for affected parties by the decision (Focus on primary stakeholders to simplify analysis until the decision maker become comfortable with the process).

- What is the magnitude of the consequences and the probability that the consequences will happen?
- Short term vs. Long term consequences – will decision be valid over time.
- Broader systemic consequences – tied to symbolic and secrecy

♣ Symbolic consequences – Each decision sends a message.

♣ Secrecy consequences – What are the consequences if the decision or action becomes public?

- Did the management consider relevant cognitive barriers/biases?
- Consider what the decision would be based only on consequences – then move on and see if it is similar given other considerations.

As a consequence, evaluation of appropriate ethical behavior will have limitations. In all outcomes there are the following possibilities:

- ✓ Right motivation with right action
- ✓ Right motivation with wrong action
- ✓ Wrong motivation with right action
- ✓ Wrong motivation with wrong action

A customer service representative takes responsibility for failing to follow through with a service action is making an **ethical decision**. A manager taking responsibility for his team not making a deadline because of his lack of oversight is ethical behaviour.

Steps for accurate ethical decision making:

1. **Step 1: Identify the problem.** Sometimes just realizing a particular situation is ethical can be the important first step. Occasionally in our organizations, we may feel that it's just the "way of doing business" and not think to question the ethical nature.
2. **Step 2: Identify the potential issues involved.** Who could get hurt? What are the issues that could negatively impact people and/or the company? What is the worst-case scenario if we choose to do nothing?
3. **Step 3: Review relevant ethical guidelines.** Does the organization have policies and procedures in place to handle this situation? For example, if a client gives you a gift, there may be a rule in place as to whether you can accept gifts and if so, the value limit of the gift you can accept.
4. **Step 4: Know relevant laws and regulations.** If the company doesn't necessarily have a rule against it, could it be looked at as illegal?
5. **Step 5: Obtain consultation.** Seek support from supervisors, co-workers, friends, and family, and especially seek advice from people who you feel are moral and ethical.
6. **Step 6: Consider possible and probable courses of action.** What are all of the possible solutions for solving the problem? Brainstorm a list of solutions—all solutions are options during this phase.
7. **Step 7: List the consequences of the probable courses of action.** What are both the positive and negative benefits of each proposed solution? Who can the decision affect?
8. **Step 8: Decide on what appears to be the best course of action.** With the facts we have and the analysis done, choosing the best course of action is the final step. There may not always be a "perfect" solution, but the best solution is the one that seems to create the most 'good' and the least 'harm'.

Most organizations provide such a framework for decision making. By providing this type of framework, an employee can logically determine the best course of action. The Department of Defence uses a similar framework whenever making decisions.

Ethics in human resources: Six guidelines for HR teams

- Know the laws.
- Prioritize professional development.
- Be an ethical HR leader.
- Understand conflicts of interest.
- Implement diversity and inclusion practices.
- Keep information confidential.

There are six broad ethical areas that need to be considered in your research. In this chapter, we will discuss voluntary participation, informed consent, confidentiality and anonymity, the potential for harm, communicating the results, and more specific ethical issues.

Major Issues in Ethical Management

- Harming Some While Benefitting Others. HR managers do much of the screening while the hiring process is still on.
- Equal Opportunity.
- Privacy.
- Compensation and Skills.
- Labor Costs.
- Opportunity for New Skills.
- Fair Hiring and Justified Termination.
- Fair Working Conditions.

Listed below, according to the ERC study, are the five most frequently observed unethical behaviours.

1. Misusing company time.
2. Abusive behaviour.
3. Employee theft.
4. Lying to employees.
5. Violating company internet policies.

Reduce ethics risk by taking these five key steps:

1. Honestly assess your needs and resources.
2. Establish a strong foundation.
3. Build a culture of integrity — from the top down.

4. Keep a “values focus” in moments of big and small and re-evaluate and revise as needed.

Common Ethical Issues in the Workplace

- Unethical Leadership.
- Toxic Workplace Culture.
- Discrimination and Harassment.
- Unrealistic and Conflicting Goals.
- Questionable Use of Company Technology.

These include; lack of diversity and discrimination, harassment, favouritism or nepotism, health and safety, environmental responsibility, data privacy, social media, and accounting espionage.

Module-II

Environmental and social issues

What is Air Pollution?

Air pollution refers to any physical, chemical or biological change in the air. It is the contamination of air by harmful gases, dust and smoke which affects plants, animals and humans drastically.

There is a certain percentage of gases present in the atmosphere. An increase or decrease in the composition of these gases is harmful to survival. This imbalance in the gaseous composition has resulted in an increase in earth’s temperature, which is known as global warming.

Types of Air Pollutants

There are two types of air pollutants:

Primary Pollutants

The pollutants that directly cause air pollution are known as primary pollutants. Sulphur-dioxide emitted from factories is a primary pollutant.

Secondary Pollutants

The pollutants formed by the intermingling and reaction of primary pollutants are known as secondary pollutants. Smog, formed by the intermingling of smoke and fog, is a secondary pollutant.

Causes of Air Pollution

Following are the important causes of air pollution:

Burning of Fossil Fuels

The combustion of fossil fuels emits a large amount of sulphur dioxide. Carbon monoxide released by incomplete combustion of fossil fuels also results in air pollution.

Automobiles

The gases emitted from vehicles such as jeeps, trucks, cars, buses, etc. pollute the environment. These are the major sources of greenhouse gases and also result in diseases among individuals.

Agricultural Activities

Ammonia is one of the most hazardous gases emitted during agricultural activities. The insecticides, pesticides and fertilizers emit harmful chemicals in the atmosphere and contaminate it.

Factories and Industries

Factories and industries are the main source of carbon monoxide, organic compounds, hydrocarbons and chemicals. These are released into the air, degrading its quality.

Mining Activities

In the mining process, the minerals below the earth are extracted using large pieces of equipment. The dust and chemicals released during the process not only pollute the air, but also deteriorate the health of the workers and people living in the nearby areas.

Domestic Sources

The household cleaning products and paints contain toxic chemicals that are released in the air. The smell from the newly painted walls is the smell of the chemicals present in the paints. It not only pollutes the air but also affects breathing.

Effects of Air Pollution

The hazardous effects of air pollution on the environment include:

Diseases

Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

Global Warming

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

Acid Rain

The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

Ozone Layer Depletion

The release of chlorofluorocarbons, halons, and hydro chlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

Effect on Animals

The air pollutants suspend on the water bodies and affect the aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animal species.

Air Pollution Control

Following are the measures one should adopt, to control air pollution:

Avoid Using Vehicles

People should avoid using vehicles for shorter distances. Rather, they should prefer public modes of transport to travel from one place to another. This not only prevents pollution, but also conserves energy.

Energy Conservation

A large number of fossil fuels are burnt to generate electricity. Therefore, do not forget to switch off the electrical appliances when not in use. Thus, you can save the environment at the individual level. Use of energy-efficient devices such CFLs also controls pollution to a greater level.

Use of Clean Energy Resources

The use of solar, wind and geothermal energies reduce air pollution at a larger level. Various countries, including India, have implemented the use of these resources as a step towards a cleaner environment.

Other air pollution control measures include:

1. By minimizing and reducing the use of fire and fire products.
2. Since industrial emissions are one of the major causes of air pollution, the pollutants can be controlled or treated at the source itself to reduce its effects. For example, if the reactions of a certain raw material yield a pollutant, then the raw materials can be substituted with other less polluting materials.
3. Fuel substitution is another way of controlling air pollution. In many parts of India, petrol and diesel are being replaced by CNG – Compressed Natural Gas fueled vehicles. These are mostly adopted by vehicles that aren’t fully operating with ideal emission engines.
4. Although there are many practices in India, which focus on repairing the quality of air, most of them are either forgotten or not being enforced properly. There are still a lot of vehicles on roads which haven’t been tested for vehicle emissions.

5. Another way of controlling air pollution caused by industries is to modify and maintain existing pieces of equipment so that the emission of pollutants is minimized.
6. Sometimes controlling pollutants at the source is not possible. In that case, we can have process control equipment to control the pollution.
7. A very effective way of controlling air pollution is by diluting the air pollutants.
8. The last and the best way of reducing the ill effects of air pollution is tree plantation. Plants and trees reduce a large number of pollutants in the air. Ideally, planting trees in areas of high pollution levels will be extremely effective.

Water Pollution

Water is one of the most vital natural resources on earth and has been around for a long time. In fact, the same water which we drink has been around in one form or the other since the time of the dinosaurs.

The earth has more than two-thirds of its surface covered with water. This translates to just over 1 octillion litres (1,260,000,000,000,000,000,000 litres) of water distributed in the oceans, rivers, lakes and streams.

That is a lot of water, however, less than 0.3% is accessible for human consumption. As commercialization and industrialization have progressed, that number continues to dwindle down. Furthermore, inefficient and outdated practices, lack of awareness and a plethora of other circumstances have led to water pollution.

What is Water Pollution?

Water pollution can be defined as the contamination of water bodies. Water pollution is caused when water bodies such as rivers, lakes, oceans, groundwater and aquifers get contaminated with industrial and agricultural effluents.

When water gets polluted, it adversely affects all lifeforms that directly or indirectly depend on this source. The effects of water contamination can be felt for years to come.

Sources Of Water Pollution

The key causatives of water pollution in India are:

- Urbanization.
- Deforestation.
- Industrial effluents.
- Social and Religious Practices.
- Use of Detergents and Fertilizers.
- Agricultural run-offs- Use of insecticides and pesticides.

Effects Of Water Pollution

The effect of water pollution depends upon the type of pollutants and its concentration. Also, the location of water bodies is an important factor to determine the levels of pollution.

- Water bodies in the vicinity of urban areas are extremely polluted. This is the result of dumping garbage and toxic chemicals by industrial and commercial establishments.
- Water pollution drastically affects aquatic life. It affects their metabolism, behaviour, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from reproduction to uncontrolled cell growth or cancer. This chemical is bioaccumulated in fish, chicken and meat. Chemicals such as this travel up the food chain before entering the human body.

- The effect of water pollution can have a huge impact on the food chain. It disrupts the food-chain. Cadmium and lead are some toxic substances, these pollutants upon entering the food chain through animals (fish when consumed by animals, humans) can continue to disrupt at higher levels.
- Humans are affected by pollution and can contract diseases such as hepatitis through faecal matter in water sources. Poor drinking water treatment and unfit water can always cause an outbreak of **infectious diseases** such as cholera, etc.
- The ecosystem can be critically affected, modified and destructured because of water pollution.

Pollution of the Ganges

Some rivers, lakes, and groundwater are rendered unfit for usage. In India, the River Ganges is the sixth most polluted river in the world. This is unsurprising as hundreds of industries nearby release their effluents into the river. Furthermore, religious activities such as burials and cremations near the shore contribute towards pollution. Apart from the ecological implications, this river poses serious health risk as it can cause diseases like typhoid and cholera.

Pollution of the Ganges is also driving some of the distinct fauna to extinction. The Ganges River shark is a critically endangered species that belong to the order Carcharhiniformes. The Ganges River dolphin is another **endangered species** of dolphin that is found in the tributaries of the Ganges and Brahmaputra rivers.

As per a survey, by the end of 2026, around 4 billion people will face a shortage of water. Presently, around 1.2 billion people worldwide do not have access to clean, potable water and proper sanitation. It is also projected that nearly 1000 children die every year in India due to water-related issues. Groundwater is an important source of water, but unfortunately, even that is susceptible to pollution. Hence, water pollution is quite an important social issue that needs to be addressed promptly.

Control Measures of Water Pollution

Water pollution, to a larger extent, can be controlled by a variety of methods. Rather than releasing sewage waste into water bodies, it is better to treat them before discharge. Practising this can reduce the initial toxicity and the remaining substances can be degraded and rendered harmless by the water body itself. If the secondary treatment of water has been carried out, then this can be reused in sanitary systems and agricultural fields.

A very special plant, the Water Hyacinth can absorb dissolved toxic chemicals such as cadmium and other such elements. Establishing these in regions prone to such kinds of pollutants will reduce the adverse effects to a large extent.

Some chemical methods that help in the control of water pollution are precipitation, the ion exchange process, **reverse osmosis**, and coagulation. As an individual, reusing, reducing, and recycling wherever possible will advance a long way in overcoming the effects of water pollution.

Soil pollution - Types, effects, sources and control of soil pollution

Soil pollution

Soil pollution is defined as, “contamination of soil by human and natural activities which may cause harmful effect on living organisms”. Composition of soil is listed below:

COMPONENT %

Organic mineral matter 45

Organic matter 05

Soil water 25

Soil air 25

TYPES, EFFECTS AND SOURCES OF SOIL POLLUTION

Soil pollution mainly occurs due to the following:

1. Industrial wastes
2. Urban wastes
3. Agricultural practices
4. Radioactive pollutants
5. Biological agents

Industrial wastes – Disposal of Industrial wastes is the major problem for soil pollution
Sources: Industrial pollutants are mainly discharged from various origins such as pulp and paper mills, chemical fertilizers, oil refineries, sugar factories, tanneries, textiles, steel, distilleries, fertilizers, pesticides, coal and mineral mining industries, drugs, glass, cement, petroleum and engineering industries etc.
Effect: These pollutants affect and alter the chemical and biological properties of soil. As a result, hazardous chemicals can enter into human food chain from the soil or water, disturb the biochemical process and finally lead to serious effects on living organisms.

Urban wastes – Urban wastes comprise of both commercial and domestic wastes consisting of dried sludge and sewage. All the urban solid wastes are commonly referred to as refuse.
Constituents of urban refuse: This refuse consists of garbage and rubbish materials like plastics, glasses, metallic cans, fibres, paper, rubbers, street sweepings, fuel residues, leaves, containers, abandoned vehicles and other discarded manufactured products. Urban domestic wastes though disposed off separately from industrial wastes, can still be dangerous. This happens because they are not easily degraded.

Agricultural practices – Modern agricultural practices pollute the soil to a large extent. With the advancing agro-technology, huge quantities of fertilizers, pesticides, herbicides and weedicides are added to increase the crop yield. Apart from these farm wastes, manure, slurry,

debris, soil erosion containing mostly inorganic chemicals are reported to cause soil pollution

Radioactive pollutants/ - Radioactive substances resulting from explosions of nuclear testing laboratories and industries giving rise to nuclear dust radioactive wastes, penetrate the soil and accumulate giving rise to land/soil pollution.
Ex:

1. Radio nuclides of Radium, Thorium, Uranium, isotopes of Potassium (K-40)

and Carbon (C-14) are commonly found in soil, rock, water and air.

2. Explosion of hydrogen weapons and cosmic radiations include neutron, proton reactions by which Nitrogen (N-15) produces C-14. This C-14 participates in Carbon metabolism of plants which is then into animals and human beings.

3. Radioactive waste contains several radio nuclides such as Strontium90, Iodine- 129, Cesium-137 and isotopes of Iron which are most injurious. Strontium get deposited in bones and tissues instead of calcium.

4. Nuclear reactors produce waste containing Ruthenium-106, Iodine-131, Barium- 140, Cesium-144 and Lanthanum-140 along with primary nuclides Sr-90 with a half life 28 years and Cs-137 with a half life 30 years. Rain water carries Sr-90 and Cs-137 to be deposited on the soil where they are held firmly with the soil particles by electrostatic forces. All the radio nuclides deposited on the soil emit gamma radiations.

5. **Biological agents** – Soil gets a large amount of human, animal and bird excreta which constitute a major source of land pollution by biological agents.

Ex: 1. Heavy application of manures and digested sludge can cause serious damage to plants within a few years

Control measures of soil pollution:

1. **Soil erosion can be controlled** by a variety of forestry and farm practices. Ex: Planting trees on barren slopes

Contour cultivation and strip cropping may be practiced instead of shifting cultivation

Terracing and building diversion channels may be undertaken.

Reducing deforestation and substituting chemical manures by animal wastes also helps arrest soil erosion in the long term.

2. **Proper dumping of unwanted materials:** Excess wastes by man and animals pose a disposal problem. Open dumping is the most commonly practiced technique. Nowadays, controlled tipping is followed for solid waste disposal. The surface so obtained is used for housing or sports field.

3. **Production of natural fertilizers**: Bio-pesticides should be used in place of toxic chemical pesticides. Organic fertilizers should be used in place of synthesized chemical fertilizers. Ex: Organic wastes in animal dung may be used to prepare compost manure instead of throwing them wastefully and polluting the soil.

Marine Pollution

Marine pollution has been an ever-present problem since the advent of large-scale agricultural activity and industrialization. However, significant laws and regulations at an international level to tackle the problem came only in the mid-twentieth century. During United Nations Conventions on the Law of the Sea in the early 1950s, the various stakeholders come together to deliberate and formulate laws pertaining to marine pollution. Till mid-twentieth century the majority of the scientists maintained that oceans were vast enough to be able to dilute the amount

of pollution being drained into them, thus, considering pollution harmless to the marine life.

Causes of Marine Pollution

The marine environment becomes polluted and contaminated through various sources and forms. Major sources of marine pollution are the inflow of chemicals, solid waste, discharge of radioactive elements, industrial and agricultural effluents, man-made sedimentation, oil spills, and many such factors. The majority portion of the marine pollution comes from the land that contributes to 80 percent of the marine pollution, air pollution also carries pesticides from farms and dust into the marine waters. Air and land pollution is a major contributor to the growing marine pollution that is not only hampering the aquatic ecology but also affecting the life on land. The non-point sources like wind-blown debris, agricultural runoff, and dust become the major source of pollution. Apart from these, factors like land runoff, direct discharge, atmospheric pollution, pollution caused by ships, and deep sea mining of natural resources contribute heavily.

Types of Marine Pollution

Eutrophication
When there is an excess of chemical nutrients mainly nitrates and phosphates in the water, it leads to eutrophication or nutrient pollution. Eutrophication decreases the level of oxygen, reduces the quality of water, makes the water inhabitable for fish, affects the breeding process within the marine life and increases the primary productivity of the marine ecosystem.

Acidification
Oceans act as a natural reservoir for absorbing the carbon dioxide from the Earth's atmosphere. But, due to rising level of carbon dioxide in the atmosphere, the oceans across the world are becoming acidic in nature, as a consequence, it leads to acidification of oceans. Researches and scientists have not been able to uncover the potential damage ocean acidification may have on the Earth's atmosphere. But, there is a strong concern that acidification might lead to dissolution of calcium carbonate structures, that can affect the shell formation in shellfish and also the corals.

Toxins
There are persistent toxins that do not get dissolved or disintegrate with the marine ecosystem rapidly. Toxins such as pesticides, DDT, PCBs, furans, TBT, radioactive waste, phenols, and dioxins get accumulated in the tissue cells of the marine lifeforms and lead to bioaccumulation hampering the life underwater and sometimes leads to a mutation in aquatic life forms.

Plastics
The ever-growing dependence of human population on plastic has filled the oceans and the land, it consists of 80 percent of the debris found in the oceans. Plastic dumped and found in the oceans are dangerous for the marine life forms and wildlife, as sometimes it strangles and chokes them to death. The rising levels of plastic dumps found in the oceans are suffocating, ingesting, and entangling the life underwater as well as above it.

Effects of Marine Pollution

The contamination of water by excessive nutrients is known as nutrient pollution, a type of water pollution that affects the life under water. When excess nutrients like nitrates or phosphates get dissolved with the water it causes the eutrophication of surface waters, as it stimulates the growth of algae due to excess nutrients. Most of Benthic animals and plankton are either filter feeders or deposit feeders take up the tiny particles that adhere to potentially toxic chemicals. In the ocean food chains, such toxins get concentrated upward. This makes estuaries anoxic as many particles combine chemically depletive of oxygen.

When the marine ecosystem absorbs the pesticides, they are incorporated into the food webs of the marine ecosystem. After getting dissolved in the marine food webs, these harmful pesticides causes mutations, and also results in diseases, which can damage the entire food web and cause harm to the humans. When toxic metals are dumped or flown into the oceans through drains, it engulfs within the marine food webs. It affects the biochemistry, reproduction process, can affect the tissue matter These can cause a change to tissue matter, biochemistry, behavior, reproduction, and suppress and alter the marine life's growth. Marine toxins can be transferred to several animals feeding on the fish or fish hydrolysate as a meal, toxins are then transferred to dairy products and meat of these affected land animals.

Steps to Prevent Marine Pollution

Stop using plastic and littering garbage as they not only choke up the drains but also releases into the oceans.
Ensure that chemicals mentioned above are not used anywhere near the streams of water and try cutting down on the usage of such chemicals.
For farmers, they need to switch from chemical fertilizers and pesticides and move towards the usage of organic farming methods.
Use public transport and reduce the carbon footprint by taking small and substantial measures that will not help in reducing the pollution from the environment but will ensure a safe and healthy future for the upcoming generations.
Prevent from any oil or chemical spill in the oceans and if in case there is an oil or chemical spill near you volunteer and help in cleaning out the ocean water.

Volunteer or initiate beach clean up activities and spread awareness about the same in the nearby vicinity.

Noise Pollution

What is Noise Pollution?

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

Types of Noise Pollution

Following are the three types of pollution:

- Transport Noise
- Neighbourhood Noise
- Industrial Noise

Transport Noise

It mainly consists of traffic noise which has increased in recent years with the increase in the number of vehicles. The increase in noise pollution leads to deafening of older people, headache, hypertension, etc.

Neighbourhood Noise

The noise from gadgets, household utensils etc. Some of the main sources are musical instruments, transistors, loudspeakers, etc.

Industrial Noise

It is the high-intensity sound which is caused by heavy industrial machines. According to many researches, industrial noise pollution damages the hearing ability to around 20%.

Causes and Sources of Noise Pollution

Following are the causes and sources of noise pollution:

- **Industrialisation:** Industrialisation has led to an increase in noise pollution as the use of heavy machinery such as generators, mills, huge exhaust fans are used, resulting in the production of unwanted noise.
- **Vehicles:** Increased number of vehicles on the roads are the second reason for noise pollution.
- **Events:** Weddings, public gatherings involve loudspeakers to play music resulting in the production of unwanted noise in the neighbourhood.

- **Construction sites:** Mining, construction of buildings, etc add to the noise pollution.

Noise Pollution Examples

Following are the examples of noise pollution:

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

Effects of Noise Pollution on Human Health

Noise pollution can be hazardous to human health in the following ways:

- **Hypertension:** It is a direct result of noise pollution which is caused due to elevated blood levels for a longer duration.
- **Hearing loss:** Constant exposure of human ears to loud noise that are beyond the range of sound that human ears can withstand damages the eardrums, resulting in loss of hearing.
- **Sleeping disorders:** Lack of sleep might result in fatigue and low energy level throughout the day affecting everyday activities. Noise pollution hampers the sleep cycles leading to irritation and an uncomfortable state of mind.
- **Cardiovascular issues:** Heart-related problems such as blood pressure level, stress and cardiovascular diseases might come up in a normal person and a person suffering from any of these diseases might feel a sudden shoot up in the level.

Prevention of Noise Pollution

Some noise pollution preventive measures are provided in the points below.

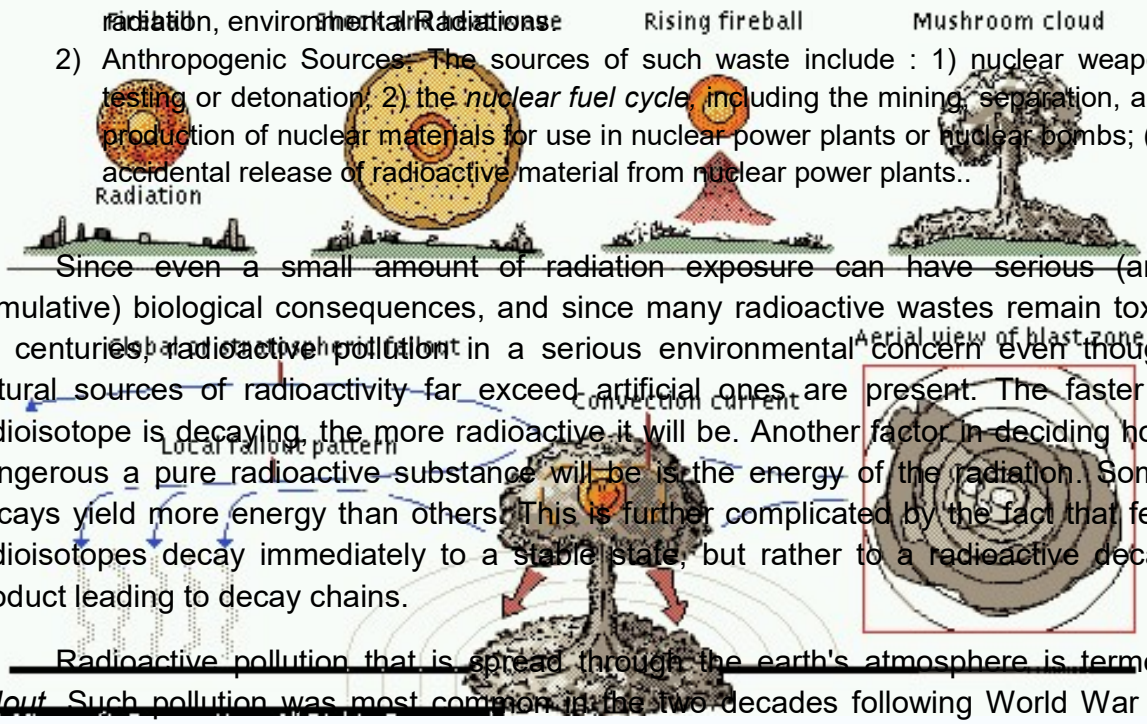
- Honking in public places like teaching institutes, hospital, etc. should be banned.
- In commercial, hospital, and industrial buildings, adequate soundproof systems should be installed.
- Musical instruments sound should be controlled to desirable limits.
- Dense tree cover is useful in noise pollution prevention.
- Explosives should be not used in forest, mountainous and mining areas.

Causes, effects and management of nuclear hazards and industrial wastes.

The spontaneous emission of particles and rays by an unstable nucleus is called Radioactivity and such substances are called Radioactive Substances eg. Radium, Uranium, Thorium. Radioactive pollution can be defined as the release of radioactive substances or high-energy particles into the air water, or earth as a result of human activity, either by accident or by design. Sometimes natural sources of radioactivity, such as radon gas emitted from beneath the ground, are considered pollutants when

they become a threat to human health. The sources of Radioactive wastes are

1) Natural sources: Solar radiation, Radionuclides in the earth Crust, Human Internal radiation, environmental Radiations.
2) Anthropogenic Sources: The sources of such waste include : 1) nuclear weapon testing or detonation; 2) the *nuclear fuel cycle*, including the mining, separation, and production of nuclear materials for use in nuclear power plants or nuclear bombs; (3) accidental release of radioactive material from nuclear power plants..



Since even a small amount of radiation exposure can have serious (and cumulative) biological consequences, and since many radioactive wastes remain toxic for centuries, radioactive pollution in a serious environmental concern even though natural sources of radioactivity far exceed artificial ones are present. The faster a radioisotope is decaying, the more radioactive it will be. Another factor in deciding how dangerous a pure radioactive substance will be is the energy of the radiation. Some decays yield more energy than others. This is further complicated by the fact that few radioisotopes decay immediately to a stable state, but rather to a radioactive decay product leading to decay chains.

Radioactive pollution that is spread through the earth's atmosphere is termed *fallout*. Such pollution was most common in the two decades following World War II, when the United States, the Soviet Union, and Great Britain conducted hundreds of nuclear weapons tests in the atmosphere. France and China did not begin testing nuclear weapons until the 1960s and continued atmospheric testing even after other nations had agreed to move their tests underground.

Three types of fallout result from nuclear detonations: local, tropospheric and stratospheric.

- Local fallout is quite intense but short-lived.
- Tropospheric fallout (in the lower atmosphere) is deposited at a later time and covers a larger area, depending on meteorological conditions.
- Stratospheric fallout, which release extremely fine particles into the upper atmosphere, may continue for years after an explosion and attain a worldwide distribution.

Types of radioactive waste:

Low level Waste (LLW) is generated from hospitals and industry, as well as the nuclear fuel cycle. It comprises paper, rags, tools, clothing, filters etc which contain small amounts of mostly short-lived radioactivity. It does not require shielding during handling and transport and is suitable for shallow land burial. To reduce its volume, it is often

compacted or incinerated before disposal.

Intermediate level Waste (ILW) contains higher amounts of radioactivity and some requires shielding. It typically comprises resins, chemical sludges and metal fuel cladding, as well as contaminated materials from reactor decommissioning. It may be solidified in concrete or bitumen for disposal. Generally short lived waste (mainly from reactors) is buried in a shallow repository, while long lived waste (from fuel reprocessing) will be disposed of deep underground.

Transuranic Waste arises mainly from weapons production, and consists of clothing, tools, rags, residues, debris and other such items contaminated with small amounts of radioactive elements -- mostly plutonium. These elements have an atomic number greater than uranium -- thus transuranic (beyond uranium). Because of the long half-lives of these elements, this waste is not disposed of as

either low level or intermediate level waste. It does not have the very high radioactivity of high level waste, nor its high heat generation. The United States currently permanently disposes of transuranic waste at the Waste Isolation Pilot Plant.

High level Waste (HLW) arises from the use of uranium fuel in a nuclear reactor and nuclear weapons processing. It contains the fission products and transuranic elements generated in the reactor core. It is highly radioactive and hot. It can be considered the "ash" from "burning" uranium. HLW accounts for over 95% of the total radioactivity

Waste Stored Safely Now

- After it is removed from the reactor, used fuel is stored at nuclear plant sites in steel-lined, concrete vaults filled with water.
- The water cools the used fuel and acts as a shield, to protect workers from radiation.
- This used fuel looks just like it did when it was placed in the reactor.
- The radioactive waste remains locked inside the uranium pellets, which are still encased in the metal fuel rods.

This used fuel has been stored safely at nuclear plant sites ever since the late 1950s, when the first nuclear power plants began making electricity. What is needed is a permanent repository for existing and future high-level waste. Initially, it was thought that spent fuel rods could be reprocessed and only to provide new fuel but also to reduce the amount of nuclear waste. However the cost of producing fuel rods by reprocessing was found to be greater than the cost of producing fuel rods from ore. Presently, India does operate reprocessing plants to reprocess spent fuel as an alternative to storing them as nuclear waste. At each step in the cycle, there is a danger of exposure to harmful radiation to possess several health and environmental concerns.

Effect of Radioactive wastes

Radioactive waste causes

- Soil pollution
- Water pollution

In these two pollutions, pollution hazards finally enter into the food chain the human who is the final victim of radioactive pollution as he is at the end of all reactions and interactions.

Effects of radioactive pollution:

- ✓ Half –life
- ✓ Energy releasing capacity
- ✓ Rate of diffusion
- ✓ Rate of deposition of the contaminant.
- ✓ Various atmospheric and climatic conditions such as wind, temperature, rainfall also determine their effects.

The possible general effects of radioactive wastes are categorised into

1) Somatic Effect
2) Genetic Effect
3) Biomagnification

Somatic effect: Affects somatic cells. It appears within individual and disappears with the death of the individual.

Immediate	: Anaemia, Reduced immune response, Haemorrhage , skin
Delayed	: Eye cataract, Leukemia, Cardiovascular disease, Premature

Genetic Effects: The radiation affects the genes of the gamete cells. The changes are not apparent in the individual. The effects are exhibited by offspring and in the subsequent generations. They affect the DNA, RNA replication and chromosome. It

- Mutation
- Chromosomal aberration
- Chromosomal fragmentation
- Inhibition of RNA,DNA synthesis

Radioactive Pollution Incidents:

The two best known examples illustrating the effect of fallout contamination are the bombing of Hiroshima and Nagasaki, Japan in 1945, and the Chernobyl Nuclear Power Station disaster in April 1986. Within five years of the American bombing of Japan, as many as 225,000 people had died as a result of long-term exposure to radiation from the bomb blast, chiefly in the form of fallout.

The disaster at the Chernobyl Nuclear Power Station in Ukraine on April 26, 1986 produced a staggering release of radioactivity. In ten days at least 36 million curies spewed across the world. The fallout contaminated approximately 1,000 square mites (2,590 sq. km) of farmland and villages in the Soviet Union. In addition to the hundreds killed at the time of the explosion, scientists predict the eventual Soviet death toll from the Chernobyl accident is around 200,000; the estimated mortality in western Europe may be around 40,000.

Control of Radioactive pollution

The main objective in managing and disposing of radioactive (or other) waste is to protect people and the environment. This means isolating or diluting the waste so that the rate or concentration of any radionuclides returned to the biosphere is harmless. To achieve this for the more dangerous wastes, the preferred technology to date has been deep and secure burial. Transmutation, long-term retrievable storage, and removal to

- Nuclear devices should never be exploded in air. If these activities are extremely necessary they should be exploded underground.
- In nuclear reactions, closed-cycle coolant system with gaseous coolants of very high purity may be used to prevent extraneous activation products.
- In nuclear and chemical industries, the use of radio-isotopes may be carried under a set of soil or water instead of power or gaseous forms.
- In Nuclear mines, wet drilling may be employed along the underground drainage.
- Nuclear reactors must be enclosed in broad concrete walls to prevent the radiations that emerge out.
- Workers should wear protective garments and glass spectacles should be screened from radiation.
- Extreme care should be exercised in the disposal of industrial waste contaminated with radionuclides. The spend rods are very radioactive containing about 1% U 235 and 1% plutonim.

Deep Underground Disposal

Geologic repositories deep underground have been endorsed by independent scientific organizations around the world including

- The National Academy of Sciences,

- The National Research Council,

- The Congressional Office of Technology Assessment.

Nearly every other country with a nuclear energy program, including Germany, France, Japan and Sweden, has determined that Deep Geologic Disposal is the safest system of permanent nuclear waste management.

Effects of industrial effluents

Industries need a wide variety of raw materials and chemicals which are later discharged as effluents. Acids, alkalis, toxic metals, pesticides and other poisonous substances such as cyanide, dyes, oils, detergents, resins, rubbers are a few to mention. Heated effluents that impart thermal loading on receiving waters and effluents containing radio active materials are also of prime concern. Some of the

effluents such as from tanning and meat packing may also contain pathogenic bacteria. The nature and extent of pollution depends on the materials present in the effluent and on the quantity discharged.

Effects on water courses

Color : The effluents contain dyes in higher concentrations which impart color to the receiving streams and they persist for longer distances. Photosynthesis of phytoplankton is affected by these colors.

pH value : The extreme alkalinity makes the receiving water unfit for any purpose. Further, it is deleterious to most of the aquatic life.

Suspended impurities : The colloidal and suspended impurities produce turbidity in the receiving waters. The turbidity and color along with the oil and scum create an unsightly appearance.

Depletion of oxygen : Natural substances such as starch and dextrin and inorganic substances such as sulfide and nitrite present in the effluent exert an immediate oxygen demand. The stream will then be devoid of oxygen and the aquatic life are affected adversely.

Toxic substances : Chromium, sulfide, chlorine and aniline dyes present in these wastes are directly toxic to fish and microbial organisms which carryout purification. Thus the self purification of the water body is affected.

Oils : Various oils (mineral) in the effluent interfere with the oxygenation of stream as they form a blanket on the surface and prevents the entry of oxygen at air/water interface.

Dissolved minerals : The mineral materials, mostly sodium salts increase the salinity of the water and consequently it becomes unfit for irrigation.

Effects on land

1. The excess content of sodium (60%) and boron (2 mg/l) are deleterious to crops.
2. The high sodium alkalinity combined with salinity impairs the growth of plants.
3. Texture of the soil is affected by sodium and penetration of roots is prevented.
4. Soil permeability is also affected by sodium and ultimately the soil will lose its productivity.
5. Suspended and colloidal impurities clog the pores and form a mat on the surface of soil preventing the passage of air, water etc.

EFFECTS OF WATER POLLUTION

Pollution	Effects
Domestic waste	Water borne diseases like cholera (Vibrio cholera) typhoid, dysentery and various health problems , depletion of dissolved oxygen, objectionable odour.

Industrial effluents	It causes deleterious effects on living things and may bring death or sub lethal pathology of kidneys, liver, lungs, brain and reproductive system.
Agricultural waste	Excessive fertilizer leads to accumulation of nitrates in children called methemoglobinaemia. Richness of nutrients results in eutrophication.
Eutrophification	During eutrophification, algal bloom release toxic chemicals into the aquatic system. Algal Bloom leads to oxygen depletion and an increase in CO_2 level. Thus aquatic organisms begin to die which leads to succession.
Bioaccumulation (or) Biological magnification	Aquatic plants and animals can accumulate certain pesticides in their body tissues in greater concentration than in water. This phenomenon is commonly referred to as biological magnification or biological amplification eg.,DDT. It is more threatening as its concentration continuosly increases in successive trophic levels in a food chain which results in many health hazards. DDT absorbed by fish eating birds 25 ppm ↑ DDT in large fish 2 ppm ↑ DDT in small fish 0.5 ppm ↑ DDT in zooplankton 0.003 ppm ↑ DDT in water 0.000003 ppm or 0.003 ppb
Lead (pb)	Anaemia, vomiting, damage of liver, brain and kidney
Arsenic(A)	Mental disturbance, lung cancer, ulcer, kidney damage
Mercury(Hg)	Abdominal pain, headache, diarrhea, chest pain
Cadmium(Cd)	Growth retardation, diarrhea, bone deformation, kidney damage, anemia, damage to lever
Barium(Ba)	Excessive salvation, diarrhea, paralysis
Chromium(Cr)	Gastro intestinal ulceration, diseases of central nervous system, cancer, nephritis
Zinc(Zn)	Vomiting, renal damage
Copper(Cu)	Hypertension, uremia, coma
Temperature:	Reduction of dissolved oxygen , Increase in Biological Oxygen Demand Early hatching of fish eggs and fish mortality, Mitigation of aquatic biota
Radioactivity	Serious skin cancer, carcinoma, melanoma, breast cancer, leukemia, DNA breakage and cataract
Siltation	Reduced visibility, Reduction in direct light penetration, Decrease in photosynthetic rate, Chances of anaerobic digestion in the benthos zone.
Oil	Reduction of dissolved oxygen in the water, Reduction in the light penetration, Direct oil coating makes the fishes unable to respire and clog their gill slits, hydrocarbons cause necrosis, paraffins like methane and ethane are asphyxiants.

Synthetic detergent	Complex formation between DNA and mercury or cadmium results in birth defects. Although detergents are not highly toxic to fishes they do cause damage to gills and remove the protective mucus from skin and the intestine.

Effect of Solid waste

Any material that is thrown away or discarded as useless and unwanted is considered as solid waste. At first glance, the disposal of solid waste may appear to be a very simple and mundane problem. In this age of lasers, microcomputers, and space flight, it hardly seems possible that garbage disposal should present any great challenge. But many factors make solid waste disposal a complex problem of huge proportions for a modern industrial society.

Classification of solid wastes

Domestic and municipal wastes: These include garbage and rubbish, like waste paper, plastic, cloth from households, office, hostel and market.

Industrial wastes: The two general categories are process and non-process wastes. The non-process wastes are common to all industries such as packaging, office and cafeteria wastes. Process wastes are more complex and specific to the industrial plants. Their composition depends on type of products produced.

Agricultural wastes: These include cereal and millet straw, paddy husk, sugarcane trash and other crop residues.

Special wastes: The waste materials which endanger public health and welfare and seriously affect environment are : a) Radioactive wastes from atomic power stations, labs and hospitals b) Toxic wastes such as pesticides, heavy metals, pharmaceuticals c) Biological products such as antibiotics, enzymes, pathogens.

Auxiliary operations necessary for solid waste treatment

i) Transport and handling

ii) Pulverization

iii) Compaction

Transport and handling

Solid wastes are collected from source, transported in trucks with hydraulic and pneumatic system to a central place and to compact the waste to a high density, for disposal.

Pulverization

Pulverization of solid wastes is carried out prior to loading, land filling, compacting or incineration to facilitate these processes. Taw roll, impact and gyratory crushers and hammer mills are used for pulverization. It makes the solid waste homogenous and helps in greater initial settlement. The land can be more easily reclaimed and built on.

Compaction

Compaction and balling of solid wastes using hydraulic or pneumatic processes lead to reduction in refuse volume, reduction in collection and transport time and cost, lesser storage area and safety hazards and cleaner storage area.

The most effective way to ameliorate the solid waste disposal problem is to reduce the generation and toxicity of waste. But, as people search for better life and higher standard of living they tend to consume more goods and generate more wastes. Consequently society is searching for improved methods of waste management and ways to reduce the amount of waste management system. This consists of reducing the amount of toxicity of the wastes at the source, recycling, reusing or composting as much of the waste as is economically reasonable. Burning the waste that cannot be economically recycled to generate heat reduces the need for fossils and nuclear fuels.

Recycling and waste reduction play an important part in any waste management strategy. But engineering analysis clearly shows that these options alone cannot solve the solid waste problem. At the same time, according to best estimates, it may be possible to reach recycling technologies that must be developed, additional markets must be found, and industry must produce more products that are easy to recycle. All the same, even if all of these steps are successfully taken more than 160 million tons of solid waste still have to be treated by other means, such as waste – to – energy combustion and land filling.

Technologies in solid waste management

Solid waste management is a difficult process because it involves many disciplines. These include, technologies associated with the control of generation, storage, collection, transfer and transportation, processing, marketing, incineration and disposal of solid wastes. All of these processes have to be carried out within existing legal and social guidelines that protect the public health and environment and are aesthetically acceptable. They must be responsive to public attitudes and the disciplines included in the disposal process include administrative, financial, legal, architectural, planning and engineering functions. For successful integrated solid waste management plant, it is necessary that all these disciplines communicate and interact with each other in a positive interdisciplinary relationship

.The various techniques employed in solid waste management include,

1) Composting
2) Sanitary land filling (Controlled tipping)
3) Thermal process (Incineration and pyrolysis)

4) Recycling and reuse

COMPOSTING

It is being increasingly realized that composting is an environment friendly process to convert wide variety of wastes into valuable agricultural inputs. This process minimizes the environmental problems. Composts are excellent source of humus and plant nutrients, the application of which improves soil biophysical properties and organic matter status of the soil. Composting can be defined as the biological conversion of organic wastes into an amorphous dark brown to black colloidal humus like substance under conditions of optimum temperature, moisture and aeration. Nutrient content of compost depends largely on the nutrient content of the wastes. Composting is a process in which the organic portion of solid waste is allowed to decompose under carefully controlled conditions. It is a biological rather than a chemical or mechanical process; decomposition and transformation of the waste material are accomplished by the action of bacteria, fungi, and other microorganisms.

With proper control of moisture, temperature, and aeration, a composting plant can reduce the volume of raw organic material by as much as 50 per cent. In addition, composting can stabilize the waste and produce an end product that may be recycled for beneficial use. The end product is called **compost** or **humus**. It resembles potting soil in texture and earthy odor, and it may be used as a soil conditioner or mulch.

A complete municipal solid waste (MSW) composting operation includes sorting and separating, shredding and pulverizing, digestion, product upgrading, and finally marketing. Sorting and separation operations are required to isolate organic, decomposable waste materials from the plastic, glass, metal, and other non biodegradable substances. Solid waste sorting and separation methods are a key part of MSW recycling operations.

Shredding and pulverizing serve to reduce the size of the individual pieces of the organic waste, resulting in a relatively uniform mass of material. This facilitates handling, moisture control, and aeration of the decomposing waste. Size reduction also helps optimize bacterial activity and increases the rate of decomposition. After size reduction, the wastes are ready for the actual composting or digestion step. Digestion may take place in open windrow or in an enclosed mechanical facility.

A windrow is a long, low pile of the prepared organic waste, usually about 3m (10 ft) wide at the base and about 2 m (6 ft) high. Most windrows are conical in cross section and about 50 m (150 ft) in length. The composting waste is aerated by periodically turning each windrow. Turning frequency varies with moisture content and other factors. When moisture content is maintained at about 50 per cent, windrows are turned two or three times a week and in some cases daily.

Generally, open – field windrow composting takes about 5 weeks for digestion or stabilization of the waste material. An additional 3 weeks may sometimes be required to ensure complete stabilization. Temperatures in an aerobic compost windrow may reach $65^{o}C$ ($150^{o}F$) because of the natural metabolic action of thermophilic microbes that thrive at such elevated temperatures. The relatively high

temperatures destroy most of the pathogenic or disease-causing organisms that may be present in the waste.

Open-field windrow composting requires relatively large land areas. To reduce land requirements, various types of enclosed mechanical systems can be used in lieu of the open-field method. A variety of mechanical type compost systems are available. Oxygen is supplied to the waste material by forced aeration, stirring, or tumbling. In addition to reducing land requirements, enclosed mechanical compost facilities can reduce the time required for stabilization from about 5 weeks to about 1 week.

Composting is the aerobic, thermophilic degradation of organic matter present in the refuse by microbes, predominantly by fungi and actinomycetes, which are favoured by semi moist condition that prevail in the process. The control parameters for optimum composting include, temperature ($40^{O}C$), moisture (40.7%), pH (4.5 – 9.5), nutrients (C:N ratio 40:1); C:P ratio (100:1), air (0.5 – 0.8 m / d / kg volatile solid) and particle size (6-25 mm).

The digestion of the waste is carried out naturally in an outside decomposition area in windrows (for five weeks) or in mechanized composting plants (for 4 to 6 days). In natural system, the garbage is mixed with nutrient source (sewage sludge / animal manure) and a filler (wood chips) to provide entry of air. The mixture is turned over twice a week and the process is completed in 4-6 weeks. The darkening of refuse, fall in temperature and a musty odour indicate completion of the process.

Before the stabilized compost or humus can be sold for use as a mulch or soil conditioner, it must be processed further to upgrade or improve its quality and appearance. This includes drying, screening, and granulating or pelletizing. Sometimes, the compost is placed in bags, although bulk sale is more efficient and economical. Compost can increase the organic and nutrient content of soil and improve its texture and ability to retain moisture.

Co-Composting

An interesting example of integrated waste management is co-composting of municipal solid waste and sewage sludge. Sewage sludge adds nitrogen, phosphorous, and other elements that enrich the solid waste and help the composting process. The sludge is first dewatered so that it does not add too much moisture to the compost pile. The dewatered sludge and organic portion of MSW must be thoroughly mixed. At a time when ocean disposal of sludge has been banned and sludge incinerators meet with much public opposition, co-composting may offer an increasingly viable technique for processing both sludge and MSW organics prior to final disposal.

Vermicomposting

The key role of earthworms in improving the soil fertility is well known for a longer period. Earthworms feed on any organic wastes, consume three to five times their body weight and after using 5 to 10 per cent of the organic wastes for their growth, excrete the mucus coated undigested matter as worm casts. Worm casts consist of organic matter that has undergone physical and chemical

breakdown through the activity of the muscular gizzard, that grinds the material to a particle size of 1-2 micron. The nutrients present in the worm casts are readily soluble in water for the uptake of plants. Vermicastings are rich sources of macro and micronutrients, vitamins, enzymes, antibiotics, growth hormones and immobilized micro flora.

Vermicompost refers to organic manure produced by earthworms. It is a mixture of worm castings, including humus, live earthworms, their cocoons and other micro organisms. Vermicomposting is an appropriate method for disposal of non-toxic solid and liquid organic wastes. It helps in cost effective and efficient recycling of animal wastes (Poultry droppings, horse, piggery excreta and cattle dung), agricultural residues and industrial wastes using low energy.

Types of earthworms

Several types of earthworms are found in our soils. Earthworms can be divided into the following two categories:

1. Epigeic – the surface living worms
2. Endogeic – the burrowing worms

Epigeic: These worms are found on the surface and are reddish brown in colour. They do not process the soil but are efficient in composting of organic wastes. They enhance the rate of organic manure production through biodegradation or mineralization.

eg. *Lampito mauritii, Octochaetona serrata, Perionyx excavatus*

Endogeic: These species burrow and mix the soil, from different horizons in the profile. They ingest organic and mineral fraction of soil, thus promoting the formation of organo mineral complexes. Organo – mineral crumbs are brought from deeper parts of the soil profile to the surface. Different species of earthworms show specificity to soil types, moisture content and temperature.

Method of vermicomposting

- Selection of earthworm: Earthworm that is native to the local soil may be used
- Size of pit: Any convenient dimension such as 2m x 1m x 1m may be prepared
- Preparation of vermibed: A layer, 15-20 cm thick of good loamy soil above a thin layer of (5 cms) broken bricks and sand should be made.
- Inoculation of earthworms: About one hundred earthworms are introduced as an optimum inoculating density into a compost pit of about 2m x 1m x 1m, provided with vermibed
- Organic layering: It is done on the vermibed with fresh cattle dung. The compost pit is then layered to about 5 cm with dry leaves or hay or organic wastes. Moisture content of

the pit is maintained by the addition of water.

- Wet organic layering: It is done after four weeks with moist green organic waste, which can be spread over it to a thickness of 5 cm. This practice can be repeated every 4 days. Mixing of wastes periodically without disturbing the vermibed ensures proper vermicomposting. Wet layering with organic wastes can be repeated till the compost pit is nearly full.

Harvesting of compost: At maturation (after 120 days), the moisture content is brought down, by stopping the addition of water. This ensures drying of compost and migration of worms in to the vermibed. The mature compost, a fine loose granular mass (about 1500 kg), is removed from the pit, sieved, dried and packed. Matured vermicompost is rich in nutrients and recommended @ 50 t ha^{-1}.

	Characteristics of vermicompost
pH	7.00
EC dsm^{-1}	1.20
Organic carbon%	30.50
Macronutrients	
Total nitrogen %	0.66
Total P_2O_5%	1.93
Total K_2O%	0.42
Micro nutrients	
Fe (ppm)	19.8
Zn (ppm)	0.90
Mn (ppm)	16.50
Cu (ppm)	2.30

Sanitary land filling (Controlled tripping)

Land filling is the most common and economic method of solid waste disposal. The indiscriminate land filling of solid waste in open dumps without adequate control and consideration of sanitation and public health as generally followed in India is dangerous. It results in water pollution, bad odour, fire and breeding of flies and rats.

It should be replaced by sanitary land filling or controlled tipping. The construction of sanitary land filling includes:

1) Deposition of solid waste in such a way to have a working force of minimum area.

2) Spreading and compaction of waste in thin layers

3) Covering of the waste with a layer of compacted cover soil daily.

4) Final cover of the entire construction with compacted earth layer of 1.0 m thick.

The solid wastes in sanitary land fill are degraded by soil microbes. In comparison with other biological treatment systems such as activated sludge and anaerobic digestion, the microbial degradation of solid waste proceeds at a slow rate.

Thermal

process

Incineration

Incineration is a process of destruction of waste at high temperature. The combustible wastes are converted through controlled combustion to a residue, which contain no combustible matter. If land suitable for solid waste (SW) land filling operations is not available within economic haul distances, then incineration is necessary. The solid waste is reduced in volume (80% - 90%) and height (98-99%). Incinerator can accept toxic and industrial wastes of any size in solid or powdery form. The other special wastes include hospital wastes, putrifiable organic solids from slaughter houses.

Pyrolysis (Destructive distillation)

Pyrolysis is the process of conversion of biomass into solid, liquid and gaseous energy. Pyrolysis results in the chemical breakdown of organic carbon material into three basic components: 1) gas phase containing mainly hydrogen, CO_2, CO and CH_4 2) tar or oil phase containing simple organic acids, methanol and acetone and 3) char phase made up of pure carbon and inert material. Pyrolysis does not cause pollution of the atmosphere and large quantities of potentially hazardous plastics could be treated.

There is no single prescription for an integrated waste management program that successfully works in every instance. Each situation must be analyzed on its own merit, an appropriate integrated waste management plan must be developed from hard data, and social attitudes and the legal frame work must be taken into account. The waste management disposal field is in a constant state of flux and appropriate solutions should be innovative, as well as technically and economically sound.

Sludge management

Suspended solids removed from wastewater during sedimentation and then concentrated for further treatment and disposal are called **sludge** or **biosolids**. Even in fully aerobic waste treatment processes in which sludge is repeatedly recycled, most of the sludge must eventually be removed from the system. The task of treating and disposing of this material is called **sludge management**.

Sludge characteristics

The composition and characteristics of sewage sludge vary widely. Since no two wastewaters are alike, the sludges produced will differ. Furthermore, sludge characteristics change considerably with time. Wastewater sludge typically contains organics (proteins, carbohydrates, fats oils), microbes (bacteria, viruses, protozoa), nutrients (phosphates and nitrates), and a variety of household and

industrial chemicals. The higher the level of heavy metals and toxic compounds, the greater is the risk to humans and the environment. A key physical characteristic is the solids concentration, because this defines the volume of sludge that must be handled.

Sludge is treated prior to ultimate disposal for two basic reasons: **volume reduction** and **stabilization of organics**. Stabilized sludge does not have an offensive odor and can be handled without causing a nuisance or health hazard. A reduced sludge volume minimizes pumping and storage requirements and lowers overall sludge-handling costs. Several processes are available for accomplishing these two basic objectives. They include sludge thickening, digestion, dewatering, and co-composting. Incineration is considered as a final disposal option.

Sludge disposal

Widely employed methods for final disposal of waste water sludge have included ocean dumping, land filling, incineration, land application, and sale as fertilizer.

Effect of hazardous wastes

The World Health Organization (WHO) considers waste causing short term hazards such as acute toxicity by ingestion, inhalation or skin absorption , corrosivity or other skin or eye contact hazards or risk or fire and explosion and wastes causing long term hazards including chronic toxicity upon repeated exposure, carcinogenecity, resistant to detoxification process such as biodegradation, the potential to pollute underground or surface water or aesthetically objectionable properties such as offensive smell as “hazardous wastes”.

The major hazardous wastes include,

- Radionuclides
- Xenobiotics
- Heavy metals

Industrial growth, economic development, consumerisation indicate a country’s progress and life standard of individuals. Industrial growth has brought along with new problems, too. Water pollution, air pollution, land pollution, noise pollution, radioactive pollution, solid wastes, depletion of resources, scarcity of good quality water, spreading health hazards, are all the consequences of stupendous industrial activities with less attention to its negative impacts on man and his environment (Ramana, 1999). Nature’s built in mechanisms and self regulation ability has been thrown out of gear by the quantity and complexity of wastes generated by the modern society. As technological progress has followed the industrial revolution, environmental problem solving must follow technological progress. Industrial processes and products thereof both must become environmentally friendly and least damaging.

Hazardous waste management is the most challenging task before the different

technologies. Although efforts are continuously on to improve upon the raw material usage, processes and search for alternative eco friendly products, the generation of hazardous wastes and their quantitative contribution requires to be tackled.

Treatment technologies for hazardous wastes

Physical	:	Soil washing, Air \stream stripping, Vitrification, Solidification, Carbon adsorption, Ion exchange.
Thermal	:	Incineration
Chemical	:	Solvent extraction, oxidation, ozonolysis, Electro kinetic removal.
Biological	:	Land farming, composting, bio reactor processes, bio- enrichment, bio augmentation and landfill.

Principles of Biological Treatment methods

"***Biostimulation***" and "***bioaugmentation***" are the two main ways of initiating biological treatment, particularly in land treatment for hazardous wastes. Biostimulation makes use of existing microorganisms and makes conditions favourable for their action by adjustment of nutrients, pH, temperature, growth factors etc. Bioaugmentation involves externally introduced cultures pure or mixed with specific degradation capacities. Bioaugmentation if done for biodegradation, introduced microorganisms should able to remain viable, should compete with the existing microorganisms.

Genetic, biochemical and ecological ability of microorganisms used plays important role in biodegradation. Although a faster kinetic rate will mean a less expensive system, biomass with a slow specific growth rate responds more favourably to shock loadings. Reactors are to be designed so that microbiological systems are properly controlled under various operating conditions to give effluents of acceptable quality.

Treatment systems

Suspended growth and fixed film are the two main categories of treatment systems although combinations of them are widely used. Immobilised systems are less sensitive to toxicity and have higher efficiency in degradation of hazardous wastes. Fixed film systems are more stable due to a higher biomass concentration and resistance to mass transfer. In fixed films, no wash out of organisms occurs even if the growth rate of the organisms is greatly reduced. Land treatment is the most widely used option to treat toxic wastes .

Microbial Cultures for biodegradation

Biological detoxification may be carried out using pure cultures or mixed cultures. Mixed cultures have a potential advantage over pure cultures in the degradation of toxic compounds in hazardous wastes. Mixed cultures are particularly useful when complete degradation of toxic organics to CO_2, CH_4, H_2S, N_2 etc. Enrichment and selection procedures are useful in selecting mixed cultures carrying out degradation.

Biotechnological process for treating liquid waste containing toxic metals

- Adsorption
- Extra cellular precipitation
- Uptake by purified bio polymer

Adsorption of heavy metals to living or dead cells, extra cellular polysaccharide , capsules and slime layer all referred as biosorption. Cell walls and envelops of bacteria, yeast, algae are very

efficient in bio sorption due to the charged group present in them. Metals may deposit around cells in the form of phosphates, sulfates or oxides.

Advantages of Biological Treatment methods

- These methods have economic advantages over other methods.
- Diversity of degradation action is possible by biological treatment.
- These methods are robust and have a large capacity for degrading toxic and hazardous materials.

Disadvantages of Biological treatment

i. Difference in wastes

Microbial enzymes responsible for degradation are specific for individual compounds , no single organism destroy all wastes.

ii. Concentration of waste chemicals

Higher concentration of toxic chemicals inhibit the survival of key members.

iii. Inhibitory mixtures

Industrial wastes / contaminated sites contain not only the toxic chemicals but also the other chemicals that incompatible with the catabolism of target compounds.

iv. Rate of degradation

Because of the above problems the degradation / treatment process is very slow and hence, development of improved strains essential.

Cloning vector for environmental applications

The environmental applications of genetically engineered organisms requires the use of cloning vector that function under environmental conditions are stably maintained , non transmissible , cost effective , environmentally friendly Modern molecular biological techniques, in particular rapid sequencing, the polymerase chain reaction, and site-directed mutagenesis, allow selective alteration of nearly any protein and provide an avenue into rational protein design to improve catabolic activities protein engineering may improve enzyme stability ,substrate specificity, and kinetic properties.

Construction of bacteria with multiple pathways

Genetic engineering permits the combination of several degradative activities within a single host organism. For eg: Bio remediation efforts are sometimes limited by the survival and or *in situ* performance of an added bio catalyst because of ecological factors that are not easily predicted from laboratory studies. Moreover , the combination of multiple activities in host that is easily and inexpensively cultured to high cell densities would certainly reduce fermentation costs.

Advantages of *in situ* application:

- It allows destruction of contaminants *in situ*
- Minimum risk, and environmental impact
- Minimum cost for removing, treating, and disposing

Engineering stress resistance

Microorganisms used to remediate hazardous wastes are likely to be exposed to a wide variety of environmental stresses . Stress factor can range from high concentration of contaminants, toxic metals, or solvents; through extremes in pH , oxygen tension ,

temperature , ionic strength, and nutrient concentrations; to conditions of extremely low carbon and nutrient availability. Microorganisms must adapt to these conditions to be able to effect remediation. In some cases genetic engineering may be

helpful in augmenting resistance to such stresses, there by facilitating good performance of the degradative organism under adverse conditions.

The following is the list of *in situ* options with order of preference for hazardous waste management.

- Eliminate hazardous waste generation at production process stage
- Do recovery of constituents of hazardous waste
- See if landfill is suitable and economical
- Decompose the waste by physical / chemical/biological means
- Immobilise the waste by solidification or encapsulation so that landfill becomes acceptable.

Improper disposal of hazardous and toxic waste can cause serious damages to health and environment. Recalcitrant, man made compounds and their products are of major concern in this regard. Bioremediation, is one of the most effective innovative technologies to come along in this century to treat these hazardous wastes. They offer complete destruction of contaminants and can often be applied at a lower total cost, at a faster rate. With the advancement of bioreactor designs, the use of genetically engineered microbes, biodegradation technology has been successful in making its impact felt on pollution abatement efforts.

Causes, effects and management of nuclear hazards and industrial wastes.

1.	Nuclear wastes comprises paper, rags, tools, clothing, filters etc which contain small amounts of mostly short-lived radioactivity is called as	
	a)Medium level waste	**b)Low level waste**
	c)High Level waste	d) Transuranic wastes
2.	Nuclear waste which requires 100% shielding during disposal is	
	a)Medium level waste	b)Low level waste
	c)High Level waste	d) Transuranic wastes
3.	The waste which contains elements having an atomic number greater than Uranium is	
	a)Medium level waste	b)Low level waste
	c)High Level waste	**d) Transuranic wastes**
4.	Radioactive pollution that is spread through the earth's atmosphere is called ----------	
	a) Transuranics	**b)Radioactive fallout**
	c)Radionulides	d)Low level waste
5.	The disaster at the Chernobyl Nuclear fallout contaminated approximately------ square miles of farmland and villages in Ukraine , Soviet Union.	
	a)200	b) 400
	c)800	**d) 1,000**
6.	The part of human body is the first to be affected by nuclear radiation?	
	a)Lungs	b) Brain
	c. Bone marrow	d. Liver.
7.	Vitrification is disposing nuclear waste	
	a)Burying below ground	**b)Solidifying in the form of glass**
	c)Ice Sheet Disposal	d) Deep geological disposal
8.	Converting part of the hazardous nuclear waste into a more stable material that decays quickly	
	a) Transmutation	b) Vitrification
	c)Ice Sheet Disposal	d) Deep geological disposal
9.	International Agreement is necessary for	
	a)Ice Sheet Disposal	b) Deep geological disposal
	c)Burying below ground	**d) Space Disposal**
10	Richness of nutrients in industrial waste water leads to	
	a)eutrophic condition	b)oligotrophic
	c)mesotrophic	d)none of the above
11	Increase in the concentration of a recalcitrant compounds along the food chain is	
	a)biomagnification	b)bioaccumulation
	c)biosorption	d)none of the above
12	The main problem associated with managing Indian solid waste is	
	a)segregation	b)high moisture content
	c)season variation	**d)all the above**
13	Sludge is treated prior to ultimate disposal for	

	a)stabilization of organics	b)volume reduction
	c)pathogen reduction	**d)all the above**
14	Integrated waste management is	
	a)co composting	b)composting
	c)vermicomposting	d)all the above
15	Destructive distillation ic called	
	a)pyrolysis	b)incineration
	c)controlled tripping	d)none of the above

4. **Proper hygienic condition**: People should be trained regarding sanitary habits.

Ex: Lavatories should be equipped with quick and effective disposal methods.

5. **Public awareness**: Informal and formal public awareness programs should be imparted to educate people on health hazards by environmental education.

Ex: Mass media, Educational institutions and voluntary agencies can achieve this.

6. **Recycling and Reuse of wastes:** To minimize soil pollution, the wastes such as paper, plastics, metals, glasses, organics, petroleum products and industrial effluents etc should be recycled and reused.

Ex: Industrial wastes should be properly treated at source. Integrated waste treatment methods should be adopted.

7. **Ban on Toxic chemicals:** Ban should be imposed on chemicals and pesticides like DDT, BHC, etc which are fatal to plants and animals. Nuclear explosions and improper disposal of radioactive wastes should be banned.

INTRODUCTION TO Natural disasters

Definitions:

Disaster:

The term disaster owes its origin to the French word “Desastre” which is a combination of two words ‘des’ meaning bad and ‘aster’ meaning star. Thus the term refers to ‘Bad or Evil star’.

- A disaster can be defined as “A serious disruption in the functioning of the community or a society causing wide spread material, economic, social or environmental losses which exceed the ability of the affected society to cope using its own resources”.
- A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk.
- A disaster happens when a hazard impacts on the vulnerable population and causes damage, casualties and disruption. Any hazard – flood, earthquake or cyclone which is a triggering event along with greater vulnerability (inadequate access to resources, sick and old people, lack of awareness etc) would lead to disaster causing greater loss to life and property.

Hazards:

The word ‘hazard’ owes its origin to the word ‘hasard’ in old French and ‘az-zahr’ in Arabic meaning ‘chance’ or ‘luck’.

- Hazard may be defined as “a dangerous condition or event, that threat or have the potential for causing injury to life or damage to property or the environment.”
- Hazards can be grouped into two broad categories:
    1. Natural Hazard
    2. Manmade Hazard

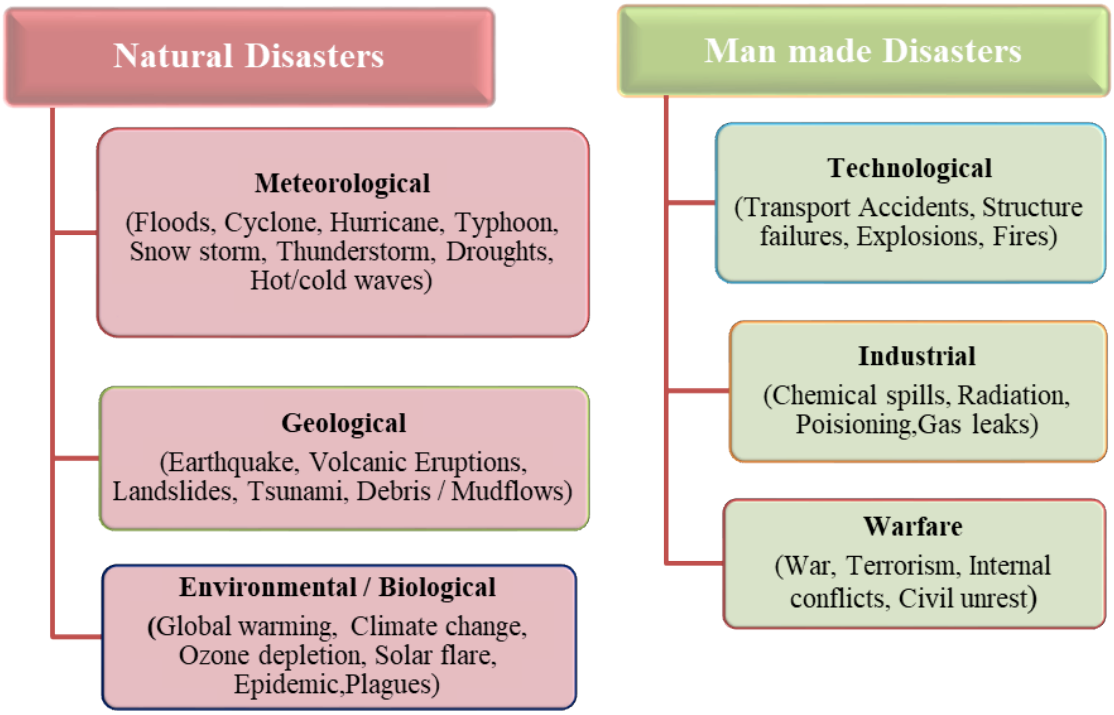
Natural hazards are hazards which are caused because of natural phenomena (hazards with meteorological, geological or even biological origin).

- Examples of natural hazards are cyclones, tsunamis, earthquake and volcanic eruption which are exclusively of natural origin.
- Landslides, floods, drought, fires are socio-natural hazards since their causes are both natural and manmade.
- For example flooding may be caused because of heavy rains, landslide or blocking of drains with human waste.

Manmade hazards are hazards which are due to human negligence.

- Manmade hazards are associated with industries or energy generation facilities and include explosions, leakage of toxic waste, pollution, dam failure, wars or civil strife etc.

Various Types of Disasters:



Difference between Disaster and Hazard:

Difference between disaster and hazard?

Hazard	Disaster
A hazard is a situation where there is a threat to life, health, environment or property.	A disaster is an event that completely disrupts the normal ways of a community. It brings on human, economical, and environmental losses to the community which the community cannot bear on its own.
Hazard are occurred at the place which has less population	Disasters are mainly occurred at over populated area.
Hazard is caused by negligence	Disaster is a results of differential behavior of nature due to many conditions.
Hazards are natural or manmade phenomenon that are a feature of our planet and cannot be prevented.	These hazards are termed as disasters when they cause widespread destruction of property and human lives.
In their dormant state, hazards just pose a threat to life and property.	Once a hazard becomes active and is no longer just a threat, it becomes a disaster.

Vulnerability:

Vulnerability may be defined as “The extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area.”

Vulnerabilities can be categorized into:

1. Physical vulnerability
2. Socio-economic vulnerability

Physical Vulnerability: It includes notions of who and what may be damaged or destroyed by natural hazard such as earthquakes or floods. It is based on the physical condition of people and elements at risk, such as buildings, infrastructure etc; and their proximity, location and nature of the hazard. It also relates to the technical capability of building and structures to resist the forces acting upon them during a hazard event.

Socio-economic Vulnerability: The degree to which a population is affected by a hazard will not merely lie in the physical components of vulnerability but also on the socioeconomic conditions. The socio-economic condition of the people also determines the intensity of the impact. For example, people who are poor and living in the sea coast don’t have the money to construct strong concrete houses. They are generally at risk and lose their shelters whenever there is strong wind or cyclone. Because of their poverty they too are not able to rebuild their houses.

Capacity:

Capacity can be defined as “resources, means and strengths which exist in households and communities and which enable them to cope with, withstand, prepare for, prevent, mitigate or quickly recover from a disaster”.

Capacities could be:

1. Physical capacity
2. Socio-economic capacity

Physical Capacity: People whose houses have been destroyed by the cyclone or crops have been destroyed by the flood can salvage things from their homes and from their farms. Some family members have skills, which enable them to find employment if they migrate, either temporarily or permanently.

Socio-economic Capacity: In most of the disasters, people suffer their greatest losses in the physical and material realm. Rich people have the capacity to recover soon because of their wealth. In fact, they are seldom hit by disasters because they live in safe areas and their houses are built with stronger materials.

Risk:

Risk is a “measure of the expected losses due to a hazard event occurring in a given area over a specific time period. Risk is a function of the probability of particular hazardous event and the losses each would cause.”

- The level of risk depends upon:
  - Nature of the hazard
  - Vulnerability of the elements which are affected
  - Economic value of those elements
- A community/locality is said to be at ‘risk’ when it is exposed to hazards and is likely to be adversely affected by its impact.

Disaster Risk Reduction:

Disaster Risk Reduction can take place in the following ways:

1. ***Preparedness:***
   This protective process embraces measures which enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be at risk from a recurring disaster. Preparedness therefore encompasses those measures taken before a disaster event which are aimed at minimising loss of life, disruption of critical services, and damage when the disaster occurs.
2. ***Mitigation:***
   Mitigation embraces measures taken to reduce both the effect of the hazard and the vulnerable conditions to it in order to reduce the scale of a future disaster. Therefore mitigation activities can be focused on the hazard itself or the elements exposed to the threat. Examples of mitigation measures which are hazard specific include water management in drought prone areas, relocating people away from the hazard prone areas and by strengthening structures to reduce damage when a hazard occurs. In addition to these physical measures, mitigation should also aim at reducing the economic and social vulnerabilities of potential disasters.

Disaster Management Cycle:

Disaster Risk Management includes sum total of all activities, programmes and measures which can be taken up before, during and after a disaster with the purpose to avoid a disaster, reduce its impact or recover from its losses. The three key stages of activities that are taken up within disaster risk management are:

(i) Pre-disaster
(ii) Disaster occurrence
(iii) Post disaster

Pre-disaster (Before a disaster):

It includes the activities taken to reduce human and property losses caused by a potential hazard. For example carrying out awareness campaigns, strengthening the existing weak structures, preparation of the disaster management plans at household and community level etc. Such risk reduction measures taken under this stage are termed as mitigation and preparedness activities.

Disaster occurrence (During a disaster):

It includes the initiatives taken to ensure that the needs and provisions of victims are met and suffering is minimized. Activities taken under this stage are called emergency response activities.

Post-disaster (After a disaster):

It includes the initiatives taken in response to a disaster with a purpose to achieve early recovery and rehabilitation of affected communities, immediately after a disaster strikes. These are called as response and recovery activities.

EARTHQUAKES

Definition:

Earthquake can be defined as the sudden shaking of the earth crust. It is one of the most destructive natural hazards. They may occur at any time of the year, day or night, with sudden impact and little warning.

Cause of Earthquake:

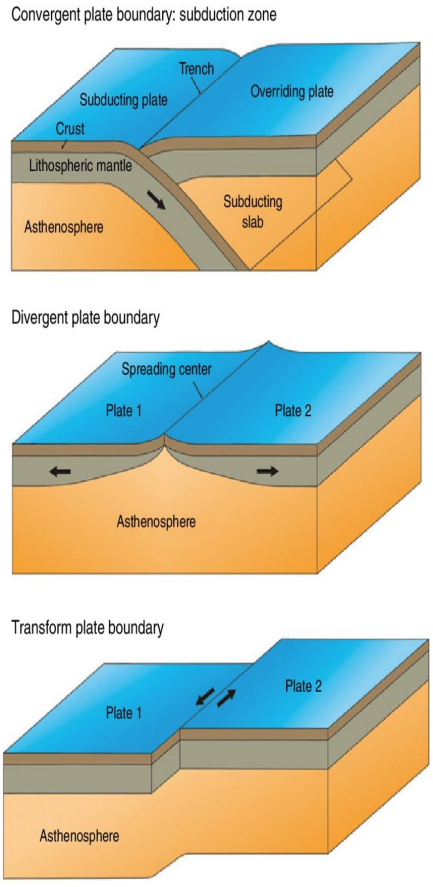
The earth's crust is a rocky layer of varying thickness ranging from a depth of about 10 kilometres under the sea to 65 kilometres under the continents. The crust is not one piece but consists of portions called 'plates' which vary in size from a few hundred to thousands of kilometres. The 'theory of plate tectonics' holds that the plates ride up on the more mobile mantle, and are driven by some yet unconfirmed mechanisms, perhaps thermal convection currents. When these plates contact each other, stress arises in the crust. These stresses can be classified according to the type of movement along the plate's boundaries:

a) Pulling away from each other,

b) Pushing against one another and

c) Sliding sideways relative to each other.

All these movements are associated with earthquakes.



Convergent - where crust is destroyed as one plate dives under another.

Divergent - where new crust is generated as the plates pull away from each other.

Transformational - where crust is neither produced nor destroyed as the plates slide horizontally past each other.

The areas of stress at plate boundaries which release accumulated energy by slipping or rupturing are known as 'faults'. The theory of 'elasticity' says that the crust is continuously stressed by the movement of the tectonic plates; it eventually reaches a point of maximum supportable strain. A rupture then occurs along the fault and the rock rebounds under its own elastic stresses until the strain is relieved. The fault rupture generates vibration called seismic (from the Greek 'seismos' meaning shock or earthquake) waves, which radiates from the focus in all directions. The point of rupture is called the 'focus' and may be located near the surface or deep below it. The point on the surface directly above the focus is termed as the 'epicentre' of the earthquake.

- Earthquakes can be of three types based on the focal depth:

  (i)Deep:- 300 to 700 kms from the earth surface

  (ii)Medium:- 60 to 300 kms

  (iii)Shallow: less than 60

  kms

- The deep focus earthquakes are rarely destructive because by the time the waves reach the surface the impact reduces. Shallow focus earthquakes are more common and are extremely damaging because of their proximity to the surface.

Measurement of Earthquake:

Earthquakes can be described by the use of two distinctively different scales of measurement demonstrating magnitude and intensity.

- Earthquake magnitude or amount of energy released is determined by the use of a **seismograph**' which is an instrument that continuously records ground vibration. The scale was developed by a seismologist named Charles Richter. An earthquake with a magnitude 7.5 on the **Richter scale** releases 30 times the energy than one with 6.5 magnitudes. An earthquake of magnitude 3 is the smallest normally felt by humans. The largest earthquake that has been recorded with this system is 9.25 (Alaska, 1969 and Chile, 1960).
- The second type of scale, the earthquake intensity scale measures the effects of an earthquake where it occurs. The most widely used scale of this type was developed in 1902 by Mercalli an Italian seismologist. The scale was extended and modified to suit the modern times. It is called the **Modified Mercalli Scale,** which expresses the intensity of earthquake effect on people, structure and the earth's surface in values from I to XII. With an intensity of VI and below most of the people can feel the shake and there are cracks on the walls, but with an intensity of XII there is general panic with buildings collapsing totally and there is a total disruption in normal life.

Typical adverse effects:

- Damage occurs to human settlement, buildings, structures and infrastructure, especially bridges, elevated roads, railways, water towers, pipelines, electrical generating facilities.
- Aftershocks of an earthquake can cause much greater damage to already weakened structures.
- Secondary effects include fires, dam failure and landslides which may block water ways and also cause flooding.
- Damage may occur to facilities using or manufacturing dangerous materials resulting in possible chemical spills.
- There may also be a breakdown of communication facilities.
- There are large number of casualties because of the poor engineering design of the buildings and close proximity of the people. About 95 per cent of the people who are killed or who are affected by the earthquake is because of the building collapse.
- There is also a huge loss to the public health system, transport and communication and water supply in the affected areas.

Possible risk reduction measures:

Community preparedness: Community preparedness is vital for mitigating earthquake impact. The most effective way to save you even in a slightest shaking is 'DROP, COVER and HOLD'.

Planning: The Bureau of Indian Standards has published building codes and guidelines for safe construction of buildings against earthquakes. Before the buildings are constructed the building plans have to be checked by the Municipality, according to the laid down bylaws. Many existing lifeline buildings such as hospitals, schools and fire stations may not be built with earthquake safety measures. Their earthquake safety needs to be upgraded by retrofitting techniques.

Public education: Public education is educating the public on causes and characteristics of an earthquake and preparedness measures. It can be created through sensitization and training programme for community, architects, engineers, builders, masons, teachers, government functionaries teachers and students.

Engineered structures: Buildings need to be designed and constructed as per the building by laws to withstand ground shaking. Architectural and engineering inputs need to be put together to improve building design and construction practices. The soil type needs to be analyzed before construction. Building structures on soft soil should be avoided. Buildings on soft soil are more likely to get damaged even if the magnitude of the earthquake is not strong. Similar problems persist in the buildings constructed on the river banks which have alluvial soil.

TSUNAMI

Definition:

The term Tsunami has been derived from a Japanese term Tsu meaning 'harbor' and nami meaning 'waves'. Tsunamis are popularly called tidal waves but they actually have nothing to do with the tides. These waves which often affect distant shores, originate by rapid displacement of water from the lake or the sea either by seismic activity, landslides, volcanic eruptions or large meteoroid impacts. Whatever the cause may be sea water is displaced with a violent motion and swells up, ultimately surging over land with great destructive power.

Causes of Tsunami:

The geological movements that cause tsunamis are produced in three major ways.

Earthquake: The most common of these are fault movements on the sea floor, accompanied by an earth-quake. They release huge amount of energy and have the capacity to cross oceans. The degree of movement depends on how fast the earthquake occurs and how much water is displaced.

Landslide: The second most common cause of the tsunami is a landslide either occurring under water or originating above the sea and then plunging into the water. The largest tsunami ever produced by a landslide was in Lituya Bay, Alaska 1958. The massive rock slide produced a wave that reached a high water mark of 50 - 150 meters above the shoreline.

Volcano: The third major cause of tsunami is volcanic activity. The flank of a volcano located near the shore or under water may be uplifted or depressed similar to the action of a fault, or, the volcano may actually explode. In 1883, the violent explosion of the famous volcano, Krakotoa in Indonesia, produced tsunami measuring 40 meters which crushed upon Java and Sumatra. Over 36,000 people lost their lives in this tyrant waves.

Predictability:

There are two distinct types of tsunami warning:

a) International tsunami warning systems and

b) Regional warning systems.

- **International Tsunami Warning Systems**: Shortly after the Hilo Tsunami (1946), the Pacific Tsunami Warning System (PTWS) was developed with its operational center at the Pacific Tsunami Warning Center (PTWC) near Honolulu, Hawaii. The PTWC is able to alert countries several hours before the tsunami strikes. The warning includes predicted arrival time at selected coastal communities where the tsunami could travel in few hours. A tsunami watch is issued with subsequent arrival time to other geographic areas.

- **Regional Warning Systems** usually use seismic data about nearby earthquakes to determine if there is a possible local threat of a tsunami. Such systems are capable enough to provide warnings to the general public in less than 15 minutes. In India, the Survey of India maintains a tide gauge network along the coast of India. The day-to-day maintenance of the gauge is carried with the assistance from authorities of the ports. Apart from the tide gauge, tsunami can be detected with the help of radars. The 2004 Indian Ocean tsunami, recorded data from four radars and recorded the height of tsunami waves two hours after the earthquake. It should be noted that the satellites observations of the Indian Ocean tsunami would not have been of any use in delivering warnings, as the data took five hours to process and it was pure chance that the satellites were overhead at that time. However, in future it is possible that the space-based observation might play a direct role in tsunami warning.

Typical adverse effects:

- Local tsunami events or those less than 30 minutes from the source cause the majority of damage. The force of the water can raze everything in its path.
- It is normally the flooding affect of the tsunami that causes major destruction to the human settlements, roads and infrastructure thereby disrupting the normal functioning of the society.
- As the waves withdraw towards the ocean they sweep out the foundations of the buildings, the beaches get destroyed and the houses carried out to sea.
- Damage to ports and airports may prevent importation of needed food and medical supplies.
- Apart from the physical damage, there is a huge impact on the public health system.
- Deaths mainly occur because of drowning as water inundates homes. Many people get washed away or crushed by the giant waves and some are crushed by the debris, causes.
- Availability of drinking water has always been a major problem in areas affected by a disaster.
- Sewage pipes may be damaged causing major sewage disposal problems.
- Open wells and other ground water may be contaminated by salt water and debris and sewage.
- Flooding in the locality may lead to crop loss, loss of livelihood like boats and nets, environmental degradation etc.

Possible risk reduction measures:

In certain tsunami prone countries some measures have been taken to reduce the damage caused on shore. Japan has implemented an extensive programme of building tsunami walls of up to 4.5m (13.5 ft) high in front of populated coastal areas. Other localities have built flood gates and channels to redirect the water from incoming tsunamis. However,framed structures in the area. The wall may have succeeded in slowing down and moderating the height of the tsunami but it did not prevent major destruction and loss of life.

Site Planning and Land Management:

Site planning determines the location, configuration, and density of development on particular sites and is, therefore, an important tool in reducing tsunami risk.

- The designation and zoning of tsunami hazard areas for such open-space uses as agriculture, parks and recreation, or natural hazard areas is recommended as the first land use planning strategy. This strategy is designed to keep development at a minimum in hazard areas.
- In areas where it is not feasible to restrict land to open-space uses, other land use planning measures can be used. These include strategically controlling the type of development and uses allowed in hazard areas, and avoiding high-value and high occupancy uses to the greatest degree possible.

Engineering structures:

Most of the habitation of the fishing community is seen in the coastal areas. The houses constructed by them are mainly of light weight materials without any engineering inputs. Therefore there is an urgent need to educate the community about the good construction practices that they should adopt such as:

- Site selection – Avoid building or living in buildings within several hundred feet of the coastline as these areas are more likely to experience damage from tsunamis.
- Construct the structure on a higher ground level with respect to mean sea level.
- Elevate coastal homes: Most tsunami waves are less than 3 meters in height. Elevating house will help reduce damage to property from most tsunamis.
- Construction of water breakers to reduce the velocity of waves.
- Use of water and corrosion resistant materials for construction.
- Construction of community halls at higher locations, which can act as shelters at the time of a disaster.

Flood management:

Flooding will result from a tsunami. Tsunami waves will flood the coastal areas. Flood mitigation measures could be incorporated.

CYCLONES

Definition:

Cyclone is a region of low atmospheric pressure surrounded by high atmospheric pressure resulting in swirling atmospheric disturbance accompanied by powerful winds blowing in anticlockwise direction in the Northern Hemisphere and in the clockwise direction in the Southern Hemisphere. They occur mainly in the tropical and temperate regions of the world.

Cyclones are known by different names in different parts of the world:

- **Typhoons** in the Northwest Pacific Ocean west of the dateline
- **Hurricanes** in the North Atlantic Ocean, the Northeast Pacific Ocean east of the dateline, or the South Pacific Ocean.
- **Tropical cyclones** -the Southwest Pacific Ocean and Southeast Indian Ocean.
- **Severe cyclonic storm"** (the North Indian Ocean)
- **Tropical cyclone** (the Southwest Indian Ocean)
- **Willie-Willie** in Australia
- **Tornado** in South America

General Characteristics:

Cyclones in India are moderate in nature. Some of the general characteristics of a cyclone are:

1. Strong winds
2. Exceptional rain
3. Storm surge

The development of a cyclone covers three stages namely

(a) Formation and initial development state:

Four atmospheric/ oceanic conditions are necessary for the formation of a cyclone:

- A warm sea temperature in excess of 26 degree centigrade, to a depth of 60 meters, which provides abundant water vapour in the air by evaporation.
- High relative humidity (degree to which the air is saturated by water vapor) of the atmosphere to a height of about 7000 meters, facilitates condensation of water vapor into droplets and clouds, releases heat energy and induces drop in pressure.

- Atmospheric instability (an above average decrease of temperature with altitude) encourages considerable vertical cumulus cloud convection when condensation of rising air occurs.
- A location of at least 4-5 latitude degrees from the Equator allow the influence of the force due to the earth's rotation (Coriolis force) to take effect in inducing cyclonic wind circulation around low pressure centers.

(b) Fully matured:

The main feature of a fully mature tropical cyclone is a spiral pattern of highly turbulent giant cumulus thundercloud bands. These bands spiral inwards and form a dense highly active central cloud core which raps around a relatively calm zone. This is called the "eye" of a cyclone. The eye looks like a black hole or a dot surrounded by thick clouds. The outer circumference of the thick cloud is called the 'eye wall'.

(c) Weakening or decay:

A tropical cyclone begins to weaken as soon as its source of warm moist air is abruptly cut off. This is possible when the cyclone hits the land, on the cyclone moves to a higher altitude or when there is the interference of another low pressure.

Indian Hazard Zones:

The 7516.6 kilometres long Indian coastline is the earth's most cyclone battered stretch of the world. Around 8 per cent of the total land area in India is prone to cyclones. About two- third of the cyclones that occur in the Indian coastline occur in the Bay of Bengal. The states which are generally affected in the east coast are West-Bengal, Orissa, Andhra Pradesh, Tamil Nadu and on the west coast Gujarat, Maharashtra, Goa, Karnataka and Kerala.

Warning:

- Low pressure and the development can be detected hours or days before it causes damage.
- The satellites track the movement of these cyclones based on which the people are evacuated from areas lively to be affected. It is difficult to predict the accuracy.
- Accurate landfall predictions can give only a few hours' notice to threatened population.
- India has one of the best cyclone warning systems in the world. The India Meteorological Department (IMD) is the nodal department for wind detection, tracking and forecasting cyclones.
- Cyclone tracking is done through INSAT satellite.
- Cyclone warning is disseminated by several means such as satellite based disaster warning systems, radio, television, telephone, fax, high priority telegram, public announcements and bulletins in press. These warnings are disseminated to the general public, the fishing community especially those in the sea, port authorities,

commercial aviation and the government machinery.

Typical Adverse effects:

High winds cause major damage to infrastructure and housing, in particular fragile constructions. They are generally followed by heavy rains and floods and, in flat coastal areas by storm surge riding on tidal waves and inundating the land over long distances of even up to 15 kilometres inland.

Physical damage: structures will be damaged or destroyed by the wind force, flooding and storm surge. Light pitched roofs of most structures especially the ones fitted on to industrial buildings will suffer severe damage.

Casualties and public health: caused by flooding and flying elements, contamination of water supplies may lead to viral outbreaks, diarrhoea, and malaria.

Water supplies: Ground and pipe water supply may get contaminated by flood waters. Crops and food supplies – high winds and rains ruin the standing crop and food stock lying in low lying areas. Plantation type crops such as banana and coconut are extremely vulnerable. Salt from the sea water may get deposited on the agricultural land and increase the salinity. The loss of the crop may lead to acute food shortage.

Communication: severe disruption in the communication links as the wind may bring down the electricity and communication towers, telephone poles, telephone lines, antennas and satellite disk and broadcasting services. Transport lines (road and rail) may be curtailed, Lack of proper communication affects effective distribution of relief materials.

Possible Risk Reduction Measures:

Coastal belt plantation - Green belt plantation along the coastal line in a scientific interweaving pattern can reduce the effect of the hazard. Providing a cover through green belt sustains less damage. Forests act as a wide buffer zone against strong winds and flash floods. Without the forest the cyclone travel freely inland. The lack of protective forest cover allows water to inundate large areas and cause destruction. With the loss of the forest cover each consecutive cyclone can penetrate further inland.

Hazard mapping – Meteorological records of the wind speed and the directions give the probability of the winds in the region. Cyclones can be predicted several days in advance. The onset is extensive and often very destructive. Past records and paths can give the pattern of occurrence for particular wind speeds. A hazard map will illustrate the areas vulnerable to cyclone in any given year. It will be useful to estimate the severity of the cyclone and various damage intensities in the region. The map is prepared with data inputs of past climatological records, history of wind speed, frequency of flooding etc.

Land use control designed so that least critical activities are placed in vulnerable areas. Location of settlements in the floodplains is at utmost risk. Sitting of key facilities must be marked in the land use. Policies should be in place to regulate land use and building codes should be enforced.

Engineered structures – structures need to be built to withstand wind forces. Good site selection is also important. Majority of the buildings in coastal areas are built with

locally available materials and have no engineering inputs. Good construction practice should be adopted such as: -

- Cyclonic wind storms inundate the coastal areas. It is advised to construct on stilts or on earth mound.
- Houses can be strengthened to resist wind and flood damage. All elements holding the structures need to be properly anchored to resist the uplift or flying off of the objects. For example, avoid large overhangs of roofs, and the projections should be tied down.
- A row of planted trees will act as a shield. It reduces the energy.
- Buildings should be wind and water resistant.
- Buildings storing food supplies must be protected against the winds and water.
- Protect river embankments.
- Communication lines should be installed underground.
- Provide strong halls for community shelter in vulnerable locations.

Flood management – Torrential rains, strong wind and storm range leads to flooding in the cyclone affected areas. There are possibilities of landslides too. Flood mitigation measures could be incorporated

Improving vegetation cover – The roots of the plants and trees keep the soil intact and prevent erosion and slow runoff to prevent or lessen flooding. The use of tree planted in rows will act as a windbreak. Coastal shelterbelt plantations can be developed to break severe wind speeds. It minimizes devastating effects. The Orissa calamity has also highlighted the need for urgent measures like shelterbelt plantation along cyclone-prone coastal areas. Species chosen for this purpose should not only be able to withstand the impact of strong cyclonic winds, but also check soil erosion.

FLOODS

Definition:

Flood is a state of high water level along a river channel or on the coast that leads to inundation of land, which is not usually submerged. Floods may happen gradually and also may take hours or even happen suddenly without any warning due to breach in the embankment, spill over, heavy rains etc.

Causes of Floods:

- Heavy rainfall
- Heavy siltation of the river bed reduces the water carrying capacity of the rivers/stream.
- Blockages in the drains lead to flooding of the area.
- Landslides blocking the flow of the stream.
- Construction of dams and reservoirs
- In areas prone to cyclone, strong winds accompanied by heavy down pour along with storm surge leads to flooding.

Indian Hazard Zones:

Floods occur in almost all the river basins of the country. Around 12 per cent (40 million hectare) of land in India is prone to floods. Most of the flood affected areas lie in the Ganga basin, Brahmaputra basin (comprising of Barak, Tista, Torsa,Subansiri, Sankosh, Dihang and Luhit), the northwestern river basin (comprising Jhelum, Chenab, Ravi, Sutlej, Beas and the Ghagra), peninsular river basin (Tapti, Narmada, Mahanadi, Baitarani, Godavari, krishna, Pennar and the Kaveri) and the coastal regions of Andhra Pradesh, Tamilnadu, orissa and Kerela. Assam, Uttar Pradesh, Bihar and Orissa are some of the states who have been severely prone to floods. Our country receives an annual rainfall of 1200 mm, 85% of which is concentrated in 3-4 months i.e June to September. Due to the intense and periodic rain, most of the rivers of the country are fed with huge quantity of water, much beyond their carrying capacity.

Warning:

- With the advancement of technology such as satellite and remote-sensing equipments flood waves can be tracked as the water level rises.
- Heavy precipitation will give sufficient warning of the coming river flood.
- High tides with high winds may indicate flooding in the coastal areas.
- Evacuation is possible with suitable monitoring and warning. Warning is issued by the Central Water Commission (CWC), Irrigation & Flood Control Department, and Water Resources Department.CWC maintains close liaison with the administrative and state engineering agencies, local civil authorities to communicate advance warning for appropriate mitigation and preparedness measures.

Typical Adverse Effects:

- The most important consequence of floods is the loss of life and property.
- Structures like houses, bridges; roads etc. get damaged by the gushing water, landslides triggered on account of water getting saturated, boats and fishing nets get damaged. There is huge loss to life and livestock caused by drowning.
- Lack of proper drinking water facilities, contamination of water (well, ground water, piped water supply) leads to outbreak of epidemics, diarrhoea, viral infection, malaria and many other infectious diseases.
- Flooding also leads to a large area of agricultural land getting inundated as a result there is a huge crop loss. This results in shortage of food, and animal fodder.
- Floods may also affect the soil characteristics. The land may be rendered infertile due to erosion of top layer or may turn saline if sea water floods the area.

Possible Risk Reduction Measures:

Mapping of the flood prone areas is a primary step involved in reducing the risk of the region. Historical records give the indication of the flood inundation areas and the period of occurrence and the extent of the coverage. Warning can be issued looking into the earlier marked heights of the water levels in case of potential threat. In the coastal areas the tide levels and the land characteristics will determine the submergence areas. Flood hazard mapping will give the proper indication of water flow during floods.

Land use control will reduce danger of life and property when waters inundate the flood plains and the coastal areas. The number of casualties is related to the population in the area at risk. In areas where people already have built their settlements, measures should be taken to relocate to better sites so as to reduce vulnerability. No major development should be permitted in the areas which are subjected to high flooding. Important facilities like hospitals, schools should be built in safe areas. In urban areas, water holding areas can be created like ponds, lakes or low-lying areas.

Construction of engineered structures in the flood plains and strengthening of structures to withstand flood forces and seepage. The buildings should be constructed on an elevated area. If necessary build on stilts or platform.

Flood Control aims to reduce flood damage. This can be done by decreasing the amount of runoff with the help of reforestation, protection of vegetation, clearing of debris from streams and other water holding areas, conservation of ponds and lakes etc. Flood Diversion include levees, embankments, dams and channel improvement. Dams can store water and can release water at a manageable rate. Flood Proofing reduces the risk of damage. Measures include use of sand bags to keep flood water away, blocking or sealing of doors and windows of houses etc. Houses may be elevated by building on raised land. Buildings should be constructed away from water bodies.

Flood Management In India, systematic planning for flood management commenced with the Five Year Plans, particularly with the launching of National Programme of Flood Management in 1954. Structural measures include, storage reservoirs flood embankments, drainage channels, anti erosion works, channel improvement works, detention basins etc. and non-structural measures include flood

forecasting, flood plain zoning, flood proofing, disaster preparedness etc. The flood management measures undertaken so far have provided reasonable degree of protection to an area of 15.81 million hectares throughout the country.

DROUGHTS

Definition:

Drought is either absence or deficiency of rainfall from its normal pattern in a region for an extended period of time leading to general suffering in the society. It is interplay between demand that people place on natural supply of water and natural event that provides the water in a given geographical region.

- It is a slow on-set disaster and it is difficult to demarcate the time of its onset and the end.
- Any unusual dry period which results in a shortage of useful water.
- Drought is a normal, recurrent feature of climate. Climate is expected to show some aberrations and drought is just a part of it.
- Drought can occur by improper distribution of rain in time and space, and not just by its amount.
- Drought is negative balance between precipitation and water use (through evaporation, transpiration by plants, domestic and industrial uses etc) in a geographical region.

Causes of Droughts:

- Deficit rainfall
- Over population
- Over grazing
- Deforestation
- Soil erosion
- Excessive use of ground and surface water for growing crops
- Loss of biodiversity

Types of droughts:

Drought proceeds in sequential manner. Its impacts are spread across different domains as listed below.

Meteorological drought:

Meteorological drought is simple absence/deficit of rainfall from the normal. It is the least severe form of drought and is often identified by sunny days and hot weather.

Hydrological drought:

Hydrological drought often leads to reduction of natural stream flows or ground water levels, plus stored water supplies. The main impact is on water resource systems.

Agricultural drought:

This form of drought occurs when moisture level in soil is insufficient to maintain average crop yields. Initial consequences are in the reduced seasonal output of crops and other related production. An extreme agricultural drought can lead to a famine, which is a prolonged shortage of food in a restricted region causing widespread disease and death from starvation.

Socio-economic drought:

Socio-economic drought correlates the supply and demand of goods and services with the three above-mentioned types of drought. When the supply of some goods or services such as water and electricity are weather dependant then drought may cause shortages in supply of these economic goods.

Elements at Risk:

In general, all those elements that are primarily dependent on water are most affected.

- It affects the rain fed crops and then slowly creeps into the irrigated crops.
- People who are dependent on agriculture and areas where the other livelihood opportunities are least developed are greatly affected.
- The herdsman, landless labourer, subsistence farmers, women, children and farm animals are the most vulnerable groups.

Distribution Pattern in India:

- Around 68 per cent of India's total area is drought prone to drought.
- 315 out of a total of 725 Talukas in 99 districts are drought prone.
- 50 million people are annually affected by drought.
- In 2001 more than eight states suffered the impact of severe drought.
- In 2003 most parts of Rajasthan experienced the fourth consecutive year of drought.

Typical adverse effects:

- As the meteorological drought turns into hydrological drought, the impacts start appearing first in agriculture which is most dependants on the soil moisture.
- Irrigated areas are affected much later than the rain fed areas.
- However, regions surrounding perennial rivers tend to continue normal life even when drought conditions are prevailing around. The impacts slowly spread into social fabric as the availability of drinking water diminishes, reduction in energy production, ground water depletion, food shortage, health reduction and loss of life, increased poverty, reduced quality of life and social unrest leading to migration.

Possible Risk Reduction Measures:

There are various mitigation strategies to cope up with drought.

Public Awareness and education: If the community is aware of the dos and don'ts, then half of the problem is solved. This includes awareness on the availability of safe drinking water, water conservation techniques, agricultural drought management strategies like crop contingency plans, construction of rain water harvesting structure. Awareness can be generated by the print, electronic and folk media.

Drought Monitoring: It is continuous observation of the rainfall situation, availability of water in the reservoirs, lakes, rivers etc and comparing with the existing water needs in various sectors of the society.

Water supply augmentation and conservation through rainwater harvesting in houses and farmers' fields increases the content of water available. Water harvesting by either allowing the runoff water from all the fields to a common point (e.g. Farm ponds) or allowing it to infiltrate into the soil where it has fallen (in situ) (e.g. contour bunds, contour cultivation, raised bed planting etc) helps increase water availability for sustained agricultural production.

Expansion of irrigation facilities reduces the drought vulnerability.

Land use based on its capability helps in optimum use of land and water and can avoid the undue demand created due to their misuse.

Livelihood planning identifies those livelihoods which are least affected by the drought. Some of such livelihoods include increased off-farm employment opportunities, collection of non-timber forest produce from the community forests, raising goats, carpentry etc.

Drought planning: the basic goal of drought planning is to improve the effectiveness of preparedness and response efforts by enhancing monitoring, mitigation and response measures.

- Planning would help in effective coordination among state and national agencies in dealing with the drought. Components of drought plan include establishing drought taskforce which is a team of specialists who can advise the government in taking decision to deal with drought situation, establishing coordination mechanism among various agencies which deal with the droughts, providing crop insurance schemes to the farmers to cope with the drought related crop losses, and public awareness generation.

LANDSLIDES

Definition :

The term 'landslide' includes all varieties of mass movements of hill slopes and can be defined as the downward and outward movement of slope forming materials composed of rocks, soils, artificial fills or combination of all these materials along surfaces of separation by falling, sliding and flowing, either slowly or quickly from one place to another.

Causes of Landslides:

There are several causes of landslide. Some of the major causes are as follows:

- **Geological Weak material:** Weakness in the composition and structure of rock or soil may also cause landslides.
- **Erosion:** Erosion of slope toe due to cutting down of vegetation, construction of roads might increase the vulnerability of the terrain to slide down.
- **Intense rainfall:** Storms that produce intense rainfall for periods as short as several hours or have a more moderate intensity lasting several days have triggered abundant landslides. Heavy melting of snow in the hilly terrains also results in landslide.
- **Human Excavation** of slope and its toe, loading of slope/toe, draw down in reservoir, mining, deforestation, irrigation, vibration/blast, Water leakage from services.
- **Earthquake shaking** has triggered landslides in many different topographic and geologic settings. Rock falls, soil slides and rockslides from steep slopes involving relatively thin or shallow disaggregated soils or rock, or both have been the most abundant types of landslides triggered by historical earthquakes.
- **Volcanic eruption:** Deposition of loose volcanic ash on hillsides commonly is followed by accelerated erosion and frequent mud or debris flows triggered by intense rainfall.

Distribution Pattern in India:

Landslides constitute a major natural hazard in our country, which accounts for considerable loss of life and damage to communication routes, human settlements, agricultural fields and forest lands. The Indian subcontinent, with diverse physiographic, seismic, tectonic and climatological conditions is subjected to varying degree of landslide hazards; the Himalayas including North-eastern mountains ranges being the worst affected, followed by a section of Western Ghats and the Vindhyas. Removal of vegetation and toe erosion has also triggered slides. Torrential rainfall on the deforested slopes is the main factor in the Peninsular India namely in Western Ghats and Nilgiris.

Typical Adverse Effects of Landslides:

- The most common elements at risk are the settlements built on the steep slopes, built at the toe and those built at the mouth of the streams emerging from the mountain valley.
- All those buildings constructed without appropriate foundation for a given soil and in sloppy areas are also at risk.
- Roads, communication lines are vulnerable.

Possible risk reduction measures:

Hazard mapping locates areas prone to slope failures. This will help to avoid building settlements in such areas. These maps will also serve as a tool for mitigation planning.

Land use practices such as:

- Areas covered by degraded natural vegetation in upper slopes are to be afforested with suitable species. Existing patches of natural vegetation (forest and natural grass land) in good condition, should be preserved
- Any developmental activity initiated in the area should be taken up only after a detailed study of the region has been carried out.
- In construction of roads, irrigation canals etc. proper care is to be taken to avoid blockage of natural drainage
- Total avoidance of settlement in the risk zone should be made mandatory.
- Relocate settlements and infrastructure that fall in the possible path of the landslide
- No construction of buildings in areas beyond a certain degree of slope

Retaining Walls can be built to stop land from slipping (these walls are commonly seen along roads in hill stations). These are constructed to prevent smaller sized and secondary landslides that often occur along the toe portion of the larger landslides.

Surface Drainage Control Works: The surface drainage control works are implemented to control the movement of landslides accompanied by infiltration of rain water and spring flows.

Engineered structures with strong foundations can withstand or take the ground movement forces. Underground installations (pipes, cables, etc.) should be made flexible to move in order to withstand forces caused by the landslide

Increasing vegetation cover is the cheapest and most effective way of arresting landslides. This helps to bind the top layer of the soil with layers below, while preventing excessive run-off and soil erosion.

Insurance will assist individuals whose homes are likely to be damaged by landslides or by any other natural hazards.

FOREST FIRES

Definition:

The most common hazard in forests is forests fire. Forests fires are as old as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. During summer, when there is no rain for months, the forests become littered with dry senescent leaves and twinges, which could burst into flames ignited by the slightest spark. The Himalayan forests, particularly, Garhwali Himalayas have been burning regularly during the last few summers, with colossal loss of vegetation cover of that region. Forest fire causes imbalances in nature and endangers biodiversity by reducing faunal and floral wealth. Traditional methods of fire prevention are not proving effective and it is now essential to raise public awareness on the matter, particularly among those people who live close to or in forested areas.

Causes of Forest Fires:

- **Natural causes-** Many forest fires start from natural causes such as lightning which set trees on fire. However, rain extinguishes such fires without causing much damage. High atmospheric temperatures and dryness (low humidity) offer favorable circumstance for a fire to start.
- **Man made causes-** Fire is caused when a source of fire like naked flame, cigarette or bidi, electric spark or any source of ignition comes into contact with inflammable material.

Causes of forest fire can be categorized into two groups:

(i) Environmental causes(which are beyond control)
(ii) Human related causes (which are controllable)

Environmental causes: These are largely related to climatic conditions such as temperature, wind speed and direction, level of moisture in soil and atmosphere and duration of dry spells. Other natural causes are the friction of bamboos swaying due to high wind velocity and rolling stones that result in sparks setting off fires in highly inflammable leaf litter on the forest floor.

Human related causes: These result from human activity as well as methods of forest management. These can be intentional or unintentional, for example:

- graziers and gatherers of various forest products starting small fires to obtain good grazing grass as well as to facilitate gathering of minor forest produce like flowers of *Madhuca indica* and leaves of *Diospyros melanoxylon*
- the use of fires by villagers to ward off wild animals
- fires lit intentionally by people living around forests for recreation
- fires started accidentally by careless visitors to forests who discard cigarette butts.

The causes of forest fire have been increasing rapidly. The problem has been accentuated by the growing human and cattle population. People enter forests even more frequently to graze cattle, collect fuel wood, timber and other minor forest products. It has been estimated that 90% of forest fires in India are man-made.

Adverse Effects of Forest Fires:

Fires are a major cause of forest degradation and have wide ranging adverse ecological, economic and social impacts, including:

- Loss of valuable timber resources
- Degradation of catchment areas
- Loss of biodiversity and extinction of plants and animals
- Loss of wildlife habitat and depletion of wildlife
- Loss of natural regeneration and reduction in forest cover
- Global warming
- Loss of carbon sink resource and increase in percentage of CO_2 in atmosphere
- Change in the microclimate of the area with unhealthy living conditions
- Soil erosion affecting productivity of soils and production
- Ozone layer depletion
- Health problems leading to diseases
- Loss of livelihood for tribal people and the rural poor, as approximately 300 million people are directly dependent upon collection of non-timber forest products from forest areas for their livelihood.

The Need of Fire Management:

The incidence of forest fires in the country is on the increase and more area is burned each year. The major cause of this failure is the piecemeal approach to the problem. Both the national focus and the technical resources required for sustaining a systematic forest fire management programs are lacking in the country. Important forest fire management elements like strategic fire centres, coordination among Ministries, funding, human resource development, fire research, fire management, and extension programs are missing. Taking into consideration the serious nature of the problem, it is necessary to make some major improvements in the forest fire management strategy for the country. The Ministry of Environment and Forests, Government of India, has prepared a National Master Plan for Forest Fire Control. This plan proposes to introduce a well-coordinated and integrated fire- management program that includes the following components:

- Prevention of human-caused fires through education and environmental modification. It will include cultural activities, engineering works, people participation, and education and enforcement. It is proposed that more emphasis be given to people participation through Joint Forest Fire Management for fire prevention.
- Prompt detection of fires through a well coordinated network of observation points, efficient ground patrolling, and communication networks. Remote sensing technology is to be given due importance in fire detection. For successful fire management and administration, a National Fire Danger Rating System (NFDRS) and Fire Forecasting System are to be developed in the country.
- Fast initial attack measures.
- Vigorous follow up action.
- Introducing a forest fuel modification system at strategic points.
- Fire fighting resources.

Each of the above components plays an important role in the success of the entire system of fire management. Special emphasis is to be given to research, training, and development.

INDUSTRIAL HAZARDS

Definitions:

Industrial hazard may be defined as any condition produced by industries that may cause injury or death to personnel or loss of product or property.

Types of Industrial hazards:

1. Mechanical hazards
2. Electrical hazards
3. Chemical hazards
4. Fire hazards
5. Dust hazards
6. Accident records

1. Mechanical Hazards:

A mechanical hazard is involving a machine or process. Motor vehicles and air bags pose mechanical hazards. Compressed gases or liquids can also be considered a mechanical hazard.

Causes of Mechanical Hazards:

- It occurs when a machine is malfunctioning.
- Machines may run either manually or automatically.
- A few machines are cutting, shearing, crushing, breaking.
- Most injuries occur when the machine needs human intervention repeatedly for its proper functioning.
- The machines are driven by a suitable power supply (electricity or steam).

Preventions of Mechanical Hazards:

- **Prevent contact:** The safeguard must prevent hands, arms, or any part of a worker's body from making contact with dangerous moving parts.
- **Secure:** Workers should not be able to easily remove with the safeguard. Guards and safety devices should be made of durable material that will withstand the conditions of normal use.
- **Protect from falling objects:** The safeguard should ensure that no objects can fall into moving parts. A small tool which is dropped into a cycling machine could easily become a projectile that could strike and injure someone.
- **Create no interference:** Proper safeguarding can actually enhance efficiency, since workers will not be afraid of injuries then.
- **Allow safe lubrication:** If possible, one should be able to lubricate the machine without removing the safeguards. Locating oil reservoirs outside of the guard, with a line leading to the lubrication point, will reduce the need for the operator or maintenance worker to enter the hazardous area.

2. Electrical Hazards:

Shock is one of the common electrical hazards. It occurs when the electric current passes through the body. This is possible when human is in contact with a conductor carrying a current and simultaneously in contact with the ground. This is referred to as SHORT CIRCUIT .

Causes of Electrical Hazards:

Different sources of electrical hazards are short circuit, electrostatic hazards and explosive materials.

A worker will receive a shock when he/she:

- Touches two wires at different voltages at the same time.
- Touches the phase standing on the ground
- Touches the phase having wet cloth and high humidity.
- Receive a shock from electrical components those are not grounded properly.
- Touching another person receiving an electrical shock.

Preventions of Electrical Hazards:

- Power equipment should be plugged into wall receptacles with power switches in the off position.
- Electrical equipment should be unplugged by grasping the plug and pulling. Never pull or jerk the cord to unplug the equipment.
- Frayed, cracked or exposed wiring on equipment cords must be corrected. Also check for defective cord clamps at locations where the power cord enters the equipment or the attachment plug.
- Temporary or permanent storage of materials must not be allowed within 3 feet of electrical equipment.
- Any electrical equipment causing shocks or which has high leakage potential must be tagged with a DANGER—DO NOT USE label or equivalent

3. Chemical Hazards:

Chemical hazards are systems where chemical accidents could occur under certain circumstances. Such events include fires, explosions, leakages or release of toxic or hazardous materials that can cause people illness, injury, or disability. Chemical accident means an accident involving a fortuitous, or sudden or unintended occurrence while handling any hazardous chemicals resulting in continuous, intermittent or repeated exposure to death, or injury to, any person or damage to any property but does not include an accident by reason only of war or radio-activity.

Causes of Chemical Hazards:

- Solvents used in extraction plants, purification of synthetic drugs and in chemical analysis may produce vapours.
  This vapours or gases may produce:
  - Breathing problem and suffocation to worker.
  - Irritation or burn to eye or skin of the worker.
  - Explosion in the work place.
  - General anaesthesia or death e.g. chloroforms and ether vapour

- Liquid chemicals if spilled on workers may produce
  - Dehydration by strong dehydrating agents e.g. concentrated sulphuric acid.
  - Burning by strong acid or alkalis.
  - Oxidation by strong oxidizing agents.

- Dusts of chemicals produced from different equipment may produce
  - Dermatitis or dust allergies to the workers.
  - Skin and eye irritations.
  - Resistance to certain antibiotics e.g. resistant to chloroform if the same worker is exposed to it regularly.
  - Some dusts may be carcinogenic (producing cancers).

Preventions of Chemical Hazards:

- Before starting work with a chemical a "chemical hazard pocket guide" should be consulted for necessary information about the chemical. It will give the type of reaction the chemical may produce, its in flammability, carcinogenicity, prevention and treatment procedures etc.
- No eating, drinking, or smoking where chemicals are used.
- Skin should be covered with protective clothing.
- Clothing should be removed immediately it gets wet or contaminated with a chemical.
- Eyes or skins should be washed with plenty of water after an accident
- Face mask may be used in toxic dust or gases.
- Workers working in antibiotic related products must be changed routinely so that an individual is not exposed to a certain antibiotic for a long period of time.
- Whenever a dust allergy or respiratory problem precipitates the worker should immediately be removed from the work place and put under proper healthcare.
- In case of inflammable gas or solvent leakage the exhaust fans should be started and all the source of fire should be extinguished.

4. Fire Hazards:

Fire hazards are the workplace hazards that involve the presence of flame or risk of an uncontrolled fire.

Causes of Fire Hazards:

- Class A Fires: These are fires in ordinary combustible materials such as wood, cloth, paper etc. those produce glowing ember.
- Class B Fires: These are fires of flammable petroleum products, liquids, gases and greases etc.
- Class C Fires: These fires involve energized electrical equipment.
- Class D Fires: These are fires in combustible metals.

Preventions of Fire Hazards:

- **Fire Extinguishers:** Fire extinguishing agents work by:
  - removal of fuel e.g. blanketing with foam or interposing a layer of gas between the fuel and the flames .
  - by removal of oxygen e.g. by dilution with inert gases or vapours .
  - by removal of heat by cooling with water or other extinguishing agents

- **Water based fire extinguishers:** They produce CO_2 by reaction with acid and carbonates, or CO_2 is kept under pressure. E.g. Portable fire extinguisher, Soda-Ash Extinguisher, Antifreeze Extinguisher.

- **Water based foams:** Two types of foams are available. Chemical foams and Mechanical foams. Chemical foams are bubbles filled with CO_2 produced by chemical reaction in an aqueous solution mixed with a foaming agent. The reacting chemicals are usually of sodium carbonate and ammonium sulphate. Mechanical foams are bubbles filled with air. Foams forms barrier and prevents contact between fuel and air.

- **Dry chemicals:** These are finely divided solid particles usually discharged through a hose pipe. Usually they contain sodium bicarbonate, potassium bicarbonate and ammonium sulphate.

5. Dust Hazards:

Combustible dust is defined as a solid material composed of distinct particles or pieces, regardless of size, shape, or chemical composition, which presents a fire or deflagration hazard when suspended in air or some other oxidizing medium over a range of concentrations.

Causes of Dust Hazards:

- Grinding or milling of drugs, excipients, or herbal products.
- During weighing dusts may float on air.
- During powder mixing dusts may be generated. During coating operation dusts are generated.
- During capsule filling and tablet punching operation dusts may be generated.

Preventions of Dust Hazards:

- **Filtration:** Air is sucked through a suitable filter medium (like paper, wool, cotton-wool and nylon). Filter bags can be attached with machines where dust is produced.

- **Inertial separator:** In cyclone separator the air is circulated at high speed in a spiral manner. Due to centrifugal force the dust particles are thrown outward and the particles are collected at the bottom and the clean air comes out through the top.

- **Electrostatic separator:** It consists of metal tubes though which a conductor wire is passed. Several thousand volts of DC current is applied on the metal wire. When air is passed through the pipes the dust particles becomes charged and precipitates on the inner wall of the tube and clean air passes out. Periodically the dust is collected.

EPIDEMICS

Definition:

An **epidemic** is the rapid spread of infectious disease to a large number of people in a given population within a short period of time, usually two weeks or less.

An epidemic may be restricted to one location; however, if it spreads to other countries or continents and affects a substantial number of people, it may be termed a pandemic.

Causes of Epidemics:

- Epidemics relating to the spread of infectious diseases are caused by the lack of knowledge on specific ways a germ is transmitted and the ability for treatments to be effective in controlling the spread of the disease. There are viruses, bacteria, fungi, and protozoa, classifications of disease organisms. Each strain can mutate when exposed in the human body or other living organisms and form new strains of that disease. It is very difficult for scientists and doctors to keep up with this as many environmental factors can influence mutations also. So because of this, until new sanitation preventive measures and treatments are discovered, many diseases spread quickly resulting in an epidemic.
- The conditions which govern the outbreak of epidemics include infected food supplies such as contaminated drinking water and the migration of populations of certain animals, such as rats or mosquitoes, which can act as disease vectors. Certain epidemics occur at certain seasons.
- For example, whooping-cough occurs in spring, whereas measles produces two epidemics, one in winter and one in March. Influenza, the common cold, and other infections of the upper respiratory tract, such as sore throat, occur predominantly in the winter. There is another variation, both as regards the number of people affected and the number who die in successive epidemics: the severity of successive epidemics rises and falls over periods of five or ten years.

Typical Adverse Effects of Epidemics:

Direct Effects of Epidemics:

- Epidemics usually affect large number of individuals and can lead to complications including disabilities and death.
- There is always a possibility of existence of sufficient number of disease carriers who may favour the resurgence and spread of disease.
- On seeing the suffering and deaths especially within close relatives, psychological effects are also common during epidemics.

Indirect Effects of Epidemics:

- Social and political disruption due to tension and law and order problems.
- Economic loss arising from lack of strength of cultivates.
- Economic loss arising from lack of strength of cultivates.
- Scarcity of clean food and water leading to malnutrition and starvation.

Mitigation measures:

- Investment in improved sanitation, provision of clean water and better urban infrastructure can reduce the frequency of human contact with pathogenic agents.
- Building strong health systems and supporting proper nutrition will help ensure good baseline levels of health, making people less susceptible to infectious diseases.
- Investment in reliable disease surveillance in both human and animal populations will help in reducing epidemics.
- Technological solutions can help minimize the burden of sizable outbreaks and epidemics.
- Better and less costly treatments including novel antibiotics and antiviral to counter resistant diseases, are sorely needed. New and improved vaccines are even more important.

Heat wave

Meaning and definition

Heat-wave is a condition of atmospheric temperature that leads to physiological stress, which sometimes can claim human life.

- Heat-wave is defined as the condition where maximum temperature at a grid point is 3˚C or more than the normal temperature, consecutively for 3 days or more.
- World Meteorological Organization defines a heat wave as five or more consecutive days during which the daily maximum temperature exceeds the average maximum temperature by five degrees Celsius.
- If the maximum temperature of any place continues to be more than **45° C** consecutively for two days, it is called a heat wave condition.

There will be no harm to the human body if the environmental temperature remains at 37° C. Whenever the environmental temperature increases above 37° C, the human body starts gaining heat from the atmosphere. If humidity is high, a person can suffer from heat stress disorders even with the temperature at 37°C or 38°C.

Causes of Heat waves:

A heat wave occurs when a system of high atmospheric pressure moves into an area. In such a high-pressure system, air from upper levels of our atmosphere is pulled toward the ground, where it becomes compressed and increases in temperature. This high concentration of pressure makes it difficult for other weather systems to move into the area, which is why a heat wave can last for several days or weeks. The longer the system stays in an area, the hotter the area becomes. The high-pressure inhibits winds, making them faint- to-nonexistent. Because the high-pressure system also prevents clouds from entering the region, sunlight can become punishing, heating up the system even more. The combination of all of these factors come together to create the exceptionally hot temperatures we call a heat wave.

Adverse Effects of Heat waves:

- Heat waves causes serious health risks like dehydration, heat rash, heat cramps, sunburn, heat exhaustion, heat stroke etc.
- Excessive heat causes psychological stress
- Abnormally hot temperatures cause electricity demand to increase during the peak summertime hours which leads to electricity spikes due to increased air conditioning use, which can create power outages. As a result, available electricity supplies are challenged during a higher, wider, peak electricity consumption period.
- If a heat wave occurs during a drought, which dries out vegetation, it can contribute to bushfires and wildfires.

- Heat waves can cause roads and highways to buckle and melt water lines to burst, and power transformers to detonate, causing fires.

Mitigation measures:

- **Establish Early Warning System and Inter-Agency Coordination** to alert residents on predicted high and extreme temperatures. Who will do what, when, and how is made clear to individuals and units of key departments, especially for health.

- **Capacity building / training programme** for health care professionals at local level to recognize and respond to heat-related illnesses, particularly during extreme heat events. These training programs should focus on medical officers, paramedical staff and community health staff to reduce mortality and morbidity.

- **Public Awareness and community outreach** Disseminating public awareness messages on how to protect against the extreme heat-wave through print, electronic and social media and Information, Education and Communication (IEC) materials such as pamphlets, posters and advertisements and Television Commercials (TVCs) on Do's and Don'ts and treatment measures for heat related illnesses.

- **Collaboration with non government and civil society:** Collaboration with non-governmental organizations and civil society organizations to improve bus stands, building temporary shelters, wherever necessary, improved water delivery systems in public areas and other innovative measures to tackle Heat wave conditions.

Manmade Disasters

Man-made disasters

Human-induced disasters are very dangerous catastrophes caused by humans. Chemical spills, hazardous material spills, explosives, chemical or biological attacks, nuclear blasts, rail accidents, airline crashes, or groundwater poisoning are all instances of man-made disasters.

Causes of manmade disaster
Ignorance- tourism
Carelessness- terrorism
Unawareness- vandalism
Illiteracy- weapons
Human error- chemicals
Sticks- water and sewage overflow

Types of manmade disaster
1-Structural collapse
2- Transportation accident

- **Road accidents**

- **Rail accidents**

3- Air accidents
4- Sea travel attack

5- Space accident
6- Terrorism
7- Epidemic

Contemporary social issues affecting business environment

1- Global climate change

2- Worker health and safety

3- Child labour

National legislative development

The child labour (prohibition and regulation)Act. 1986- the act prohibits the employment of children below the age of 14 in hazardous occupations identified in a list by the law. The list was expanded in 2006 and again in 2008. The right of children to free and compulsory Education Act of 2009- the law mandated free and compulsory education to all children aged 6 to 14 years. This legislation also mandated that 25% of seats in every private school must be allocated for children from disadvantaged groups and physical challenged children.

Model- III

Business Ethics – Definition

There are many definitions of business ethics, but the ones given by **Andrew Crane** and **Raymond C. Baumhart** are considered the most appropriate ones.

According to Crane, "Business ethics is the study of business situations, activities, and decisions where issues of right and wrong are addressed."

Baumhart defines, "The ethics of business is the ethics of responsibility. The business man must promise that he will not harm knowingly."

Concepts of ethics

Ethics*- it is dealing with judgements regarding voluntary human conducts.*

Moral*- are duties that govern behaviour of person.*

Morality- It is the standard that an individual or a group that knows what is good or bed, right or wrong.

Value- are belief that guide individual action.

Norms- are ways an individual expects all people to act.

Belief- are criteria of thought.

Features of Business Ethics

There are eight major features of business ethics −

- **Code of Conduct** − Business ethics is actually a form of codes of conduct. It lets us know what to do and what not to do. Businesses must follow this code of conduct.
- **Based on Moral and Social Values** − Business ethics is a subject that is based on moral and social values. It offers some moral and social principles (rules) for conducting a business.
- **Protection to Social Groups** − Business ethics protect various social groups including consumers, employees, small businesspersons, government, shareholders, creditors, etc.
- **Offers a Basic Framework** − Business ethics is the basic framework for doing business properly. It constructs the social, cultural, legal, economic, and other limits in which a business must operate.
- **Voluntary** − Business ethics is meant to be voluntary. It should be self-practiced and must not be enforced by law.
- **Requires Education & Guidance** − Businessmen should get proper education and guidance about business ethics. Trade Associations and Chambers of Commerce should be active enough in this matter.

Difference ethic and morality

Sl. No-	Ethics	Morality

1	Ethics is an area dealing with moral judgments which is voluntary human conduct.	Moral judgment requires moral standards by which human conducts are judged.
2-	Ethics are ultimate ends.	Moral standards are related to moral obligation. It is for the duty to do what consider being right and proper.

What Is Business Ethics?

Business ethics is the study of appropriate business policies and practices regarding potentially controversial subjects including corporate governance, insider trading, bribery, discrimination, corporate social responsibility, and fiduciary responsibilities.

What is Marketing Ethics?

Ethics in marketing involves the marketing practices of promoting fairness, social responsibility, empathy, and honesty by following ethical standards.

Through ethical marketing, organizations deliberately apply different sets of moral rights and fairness standards when marketing their products and services, practices, and behavior in the overall structure. These organizations can then develop a competitive advantage over time, thereby satisfying the organization's needs and customers.

Role of Ethics in Marketing

With time, our economic system has become sufficient at providing wants and needs for the public.

This has shifted the main focus of the market with an inclination towards ethical values while serving the needs of customers. This is primarily due to two reasons:

When there is ethical behavior from the organization's side, there is a more significant positive public attitude to the variety of services and goods they offer. They have to adhere to specific marketing standards to render their efforts valid to the general public.

In addition to this, ethical bodies and organizations tend to pressurize and hold organizations and companies accountable for their actions. There is a lot of questioning and sets of guidelines, which have to be strictly followed.

Ethics in marketing plays a key role in ethical decision making crucial for the optimized presence of a product or service in their target niche.

An ethical marketing strategy is responsible for paying heed upon different factors such as-

- Organization factors such as culture, norms, values, and opportunity
- Individual factors such as moral philosophies and values
- Stakeholder interests and concerns
- The intensity of ethical issues in marketing and organization setup
- Ethical decision making
- Evaluation of ethical outcomes

Issues in Marketing Ethics

There is a fixed set of expectations regarding the business and its transactions and how they have to be carried out. The following domains have ethical issues concerning their functioning:

1. Market Research

It revolves around the collection and analysis of information about consumers as well as competitors and the effectiveness of marketing campaigns. Ethical issues that might arise during the process are an invasion of privacy and stereotyping.

2. Market Audience

Excluding potential market sectors like LGBTs, ethnic minorities, etc. are some of the ethical marketing issues associated with the market audience.
Also targeting vulnerable audiences with a marketing campaign is also an ethical marketing issue.

3. Advertising and Promotion

Shaming rivals' products or services are considered unethical in advertising and promotion. Other ethical issues in advertising and marketing campaigns may be mistreatment of women or any human being, misleading advertising, issues related to trust, honesty, violence, profanity, sex, taste, controversy that may lead to the ethical declining of society.

4. Pricing Ethics

Different unethical pricing strategies that are considered issues in ethical marketing campaigns are-

- Bid rigging
- Dumping (pricing policy)
- Predatory pricing
- Price gouging
- Price fixing
- Supra competitive pricing
- Price discrimination
- Price skimming
- Price war
- Variable pricing

Conclusion

On the concluding note, we can define marketing ethics as an area of applied ethics that is associated with moral principles behind the operation and regulation of marketing that ethical companies use to differentiate between right and wrong marketing decisions and their implementations.

Many companies that use unethical marketing strategies do not care what is right and wrong on ethical grounds, and ultimately lose the trust of their audiences. Therefore, opting for unethical practices is never suggested by the market leaders.

HRM

Human Resource Management (HRM) deals with work force management, manpower planning and other employee related activities in an organization. Therefore, we can say that it is a special branch of management where ethics play a crucial role. HRM concerns human issues, especially those related with compensation, development, industrial relations, health and safety issues. However, there are sufficient disagreements in managing HRM issues that stem from various quarters.

Ethics and Market System

Various types of market systems affect business and HR ethics differently and hence, business ethics becomes negotiable. Occupations in which the market conditions do not favor the employees, it becomes necessary to have government and labor union interventions for controlling the possible exploitation of employees.

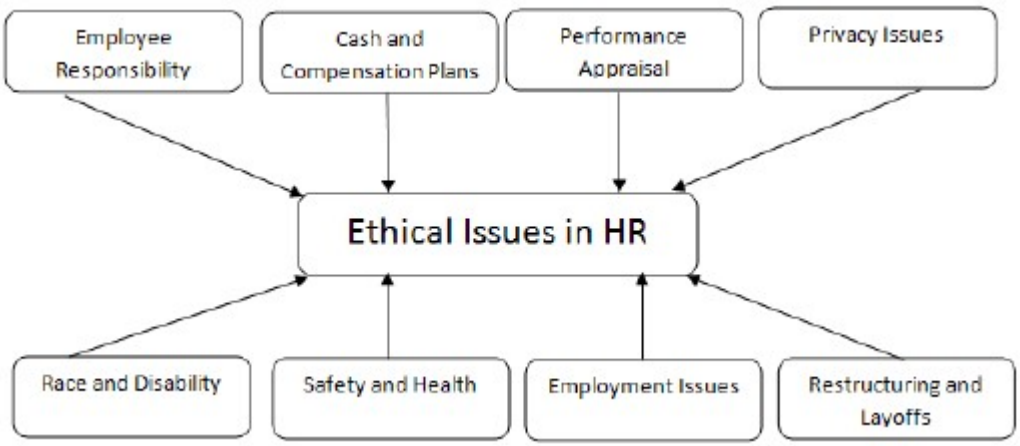
- Free market systems empower employees and the employers equally; negotiations are used to create win-win situations for both of these parties. Government or labor union interventions are often harmful in free market systems because they stall the operations and create unnecessary hindrances.

- With the growth of globalization, the concept of globalizing labor has gained importance. Trade unions have ceased to exist and the role of HR as such in issues like employee management, desirable policies and practices has become debatable topics.
- Many people now have the opinion that HR is nothing but a part of the stakeholders which initiates major strategic and policy decisions to divulge the organization and gear it towards profit making.

There cannot be a single opinion about ethics in HR that is completely convincing. Market is neither an ethical institution nor an unethical one; no policies and procedures can govern and align the markets for human well-being. However, the need of these policies and procedures cannot be denied or ignored because human development is the ultimate aim of all human initiatives.

HRM Ethics

Out of all organizational issues or policies, ethical considerations are the most difficult to deal with. Issues arise in employment, remuneration and benefits, industrial relations and health and safety.



Important Clusters of HRM related with Ethics

Some HRM issues are more important than the rest because we, as human beings, are more responsible for the development and empowerment of the human resources involved in the operation and management of organizations. Some of these issues are discussed below.

Cash and Compensation Plans

There are some general ethical issues pertaining to the employee salaries, executive perquisites and compensations and the annual incentive plans, etc. The HR department is often under pressure to increase the band of base salaries. There is always an increased pressure upon the HR function to pay out more incentives to the top management and provide justification for the same to retain them.

Further, ethical issues arise when HR deals with long-term compensation and incentive plans by consulting with the CEO or an external consultant. There is a pressure on the HR managers on favouring the interests of the top management in comparison to that of the other employees and stakeholders.

Race, Gender, and Disability

There are several examples of organizations where, until recently, the employees were treated differently based on the race, gender, origin, and their disability. This is not the case anymore since the evolution of laws and a regulatory framework standardized for the employee behavior. In ethical organisations, the only factor of appraisal is performance.

Employment Issues

Human resource managers face many dilemmas in hiring employees. One particular dilemma stems from the pressure of hiring one, who has been recommended by a friend or someone from the family of a top executive.

Another major dilemma arises due to employees who are later found to have fake documents. Both of the issues are critical. In the first case, the person may have been trained and filling the position is critical. In the second case, the person may be efficient in his work and have the right kind of attitude. Both the situations are tough and HR managers face such cases day in and day out.

Privacy Issues

All human beings working with any organization have their personal life. An employee needs the organization to directly or indirectly protect his/her personal life. This personal life includes things like the religious, political and social beliefs etc.

There are many ethical issues in HR that are related to health and safety, restructuring and layoffs and employee responsibilities. A debate is still going on whether some activities are ethically permitted and why some are not. Layoffs, for example, are not considered unethical as they were thought of in the past.

Ethical Issues on finance

Organizations that provide financial services cannot afford to have its employees leave their morals on the front door when they step inside. Finance usually depends on a very high level of ethics.

Finance Depends on Trust

Markets break down without trust. If financial markets are full of rogue traders, individuals will start to disengage from it, thereby reducing the capacity to find investments and hence reducing the economic growth. A market with strong

ethics is more inclusive which helps it to be more liquid and offer cheaper financial options.

Financial market participants often have economic freedom, and often with good reason, but the successful financial exchanges in the world are more famous for trust than the degree of their freedom.

An Ethical Framework

The simplest ethical guide for finance professionals should have three objectives –

- The first is to have higher ethical standards and a more inclusive financial system.
- The second, we should be more conscious of moral choices, but morals should not be imposed upon people in suffocating ways.
- The third objective is to keep things simple.

We often see financial market participants hesitate a moment before deciding whether to go ahead with a transaction. It is when they assess whether the transaction makes sense, feels odd or is avoidable. In that moment, people tend to ask whether they know the individuals involved in the transaction and whether a similar transaction was made earlier.

None of the two is very exacting ethical standard. We can offer these market participants some more questions, and after that it is up to them and their companies how they behave. However, that behavior should not be so ruinous that it affects the marketplace or the economy.

The key questions to ask while preparing a transaction is − have you ever faced a situation when you have put someone at an advantage over others?

Getting a loan from a client leading to its bankruptcy when one buys up the company's assets cheaper is not illegal, but it is unethical. Similarly, driving products out of market and making it hard to find is not always illegal, but it is unethical.

The Final Consideration

The consequences of a financial transaction lead us to ask whether a transaction and its full implications are clear, and whether they will be subject to scrutiny −

- If Yes, the moral responsibility of the market participants is lowered and they can concentrate on providing ethical service. In these circumstances, people are in a better situation to take correct decisions.
- If No, the moral burden on the financier is greater. In these circumstances, a written justification for the record would be a better option.

Individuals may often need to make their own moral choices. These cannot be easily codified into a list of dos and don'ts. However, people can and should be

helped to arrive at these important answers, by allowing them to ask the right set of questions.

Codes of Ethics in Finance

Different moral codes that are supposed to be followed the finance-related behavior of a company towards its employees, customers, public and other stakeholders-

1. Acting with honesty and integrity while handling dilemmas of the world of finances
2. Not associating with any real/clear conflicts of interest in personal, or company relationships
3. Providing information that is full, accurate, fair, complete, relevant, objective, understandable, and timely in and for different documents and reports
4. Acting in accordance with all the applicable rules, laws, and regulations of governments along with other relevant public/private regulatory agencies
5. Acting responsibly and in good faith with due care, carefulness, and competence without any sort of misrepresentation of material facts
6. Respecting the confidentiality of information which is acquired in the business course and such information should not be used for the personal benefit
7. Promoting ethical behavior among all the associates and stakeholders of a company
8. Adhering and promoting a code of ethics in the company

Unethical Behavior in Financial Markets

1. Faking the Numbers

In the reporting and analysis of finances, economics, investment, or business activities, “faking the numbers” is one of the common unethical behaviors.

2. Asset Misappropriation

When funds of an organization are used for the things that are not related to the organization then it is an unethical act.

3. Disclosure Concerns

Disclosing information (public or private) overly or disclosing too little is also unethical in different situations. For instance, hiding a loss from potential investors is unlawful.

4. Executive Focusing

Another unethical concern is focussing too much upon the executives and giving them too much power, as it may give power to the executive to pressure the reporting and analysis team.

5. No Direct Chain of Command

Every company should incorporate a proper chain of command for offering reporting and analysis of the finances, and if it is not there, it would be unethical.

Conclusion

Ethics is one of the most important factors in the world of finances.

In the financial industry, the participating organizations must follow a proper ethics code. This is necessary for the internal functioning of the organization as well as external decisions that affect it.

Since finance is the backbone of any business and ethics are of similar importance, ethics in finance must be followed religiously without any discrepancy.