
PAPER: 303
ANIMAL ECOLOGY AND ENVIRONMENTAL BIOLOGY.

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition. Unequal development in different countries in the promotion of health and control of diseases, especially communicable disease, is a common danger. Healthy development of the child is of basic importance; the ability to live harmoniously in a changing total environment is essential to such development. **[Source WHO]**

INTRODUCTION:

In 1948, the World Health Organization (WHO) defined health with a phrase that modern authorities still apply. **“Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.”** In 1986, the WHO made further clarifications: “A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities.” This means that health is a resource to support an individual’s function in wider society, rather than an end in itself. A healthful lifestyle provides the means to lead a full life with meaning and purpose.

TYPES:

- i. Mental health and
 - ii. Physical health
- are the two most important types of health. Spiritual, emotional, and financial health also contribute to overall health.

PHYSICAL HEALTH:

- A person who has good physical health is likely to have bodily functions and processes working at their peak.
- Looking after physical health and well-being also involves reducing the risk of an injury or health issue, such as:
 1. minimizing hazards in the workplace,
 2. practicing effective hygiene,
 3. avoiding the use of tobacco, alcohol, or illegal drugs,
 4. taking the recommended vaccines for a specific condition or country when traveling.

MENTAL HEALTH:

Mental health refers to a person's emotional, social, and psychological well-being. Mental health is as important as physical health as part of a full, active lifestyle. It is harder to define mental health than physical health because many psychological diagnoses depend on an individual's perception of their experience.

Therefore, for any individual to be healthy and safe, the individual needs to be safe both with physical aspects and mental aspects of life. **Physical aspects which mainly includes the work place and type of work the individual performs, plays vital role in one's healthy life.** India being developing country is continuously facing lots of health impacts right from the British rule till date and **Industrialization** is one such phase which brought about lots of changes in the people especially with their health.

INDUSTRIALIZATION:

- Industrialisation is the period of social and economic change that transforms a human group from an agrarian society into an industrial one.
- It is a part of a wider modernisation process, where social change and economic development are closely related with technological innovation, particularly with the development of large-scale energy and metallurgy production.
- It is the extensive organisation of an economy for the purpose of manufacturing.
- Industrialisation also introduces a form of philosophical change where people obtain a different attitude towards their perception of nature, and a sociological process of ubiquitous rationalisation.

Industrialization brought a change in population which is called as demographic transition. **Demographic transition can be defined as change in the population, for example in terms of average age, dependency ratios, life expectancy, family structures, birth rates etc.** Industrialization greatly varied in the birth and death rates of humans and this type of transition takes place in four phases;

- 1) Pre-industrialization phase,
- 2) Transitional phase,
- 3) Industrialization phase and
- 4) Post industrialization phase.

PRE-INDUSTRIALIZATION PHASE:

It's the phase where manual work was given preference than machine works. Living conditions were tough which leads to **higher birth rates** to

compensate higher infant mortality. **Higher death rates and therefore very little population growth was observed.**

TRANSITIONAL PHASE:

It's mere switching between the manual and machine work. It was the time when machines took over the work and it can be said as beginning phase of industrialization. It paved way for increase in the production especially with food products, more health care awareness among people etc. Therefore, **drop-in death rates. But birth rate remained high and hence population growth was observed.**

INDUSTRIALIZATION PHASE:

Industrial expansion occurred and more awareness about good health care benefits started among the people. Good health was given priority with almost everyone given medical attention. **Hence birth rate drops which is almost equal to death rate.**

The main reasons for such convergence in birth and death rates are;

- a) Better access to birth control due to awareness in health,
- b) Decline in infant mortality rates,
- c) Increase in job opportunities including women employment.
- d) Higher cost of living, higher cost of raising children since they do not enter work force until high-school or college.
- e) Population growth continues but at a fluctuating rates and all these depend upon the economic conditions of the people.
- f) At present, most of the developed or recently developed countries are in third stage.
- g) Other 20+ developing countries are entering the third stage (Industrialization stage).

POST INDUSTRIALIZATION PHASE:

It is the exact time when a country predominantly adopted the industries. Once the people were aware of health and its benefits, few fluctuations were noticed. **The birth rate declined almost equalling the death rates.** Several countries reached **ZERO POPULATION GROWTH.** Later the birth rate is seen to fall below the death rate and hence the total population growth shows a mere decline.

More than 30% countries are in this stage and remaining 70% countries have to reach this stage.

URBANIZATION:

The process of industrialization caused many changes among people and the standard of living among groups increased. People always tried to settle in groups in and around work place in order to reduce the cost of living initially. The settlement of groups in and around an industry paved way for new beginning in other sectors like education, hospital, etc and there came another process called urbanization.

Urbanization refers to the increasing number of people that live in urban areas. It predominantly results in the physical growth of urban areas, be it horizontal or vertical. The United Nations projected that half of the world's population is living in urban areas (at the end of 2008). By 2050 it is predicted that 64.1% and 85.9% of the developing and developed world respectively will be urbanized. **Urbanization is closely linked to modernization, industrialization, and the sociological process of rationalization.** Urbanization can describe a specific condition at a set time, i.e., the proportion of total population or area in cities or towns, or the term can describe the increase of this proportion over time. So, the term urbanization can represent the level of urban development relative to overall population, or it can represent the rate at which the urban proportion is increasing. Urbanization is not merely a modern phenomenon, but a rapid and historic transformation of human social roots on a global scale, whereby predominantly rural culture is being rapidly replaced by predominantly urban culture.

Urbanization led to several changes in people and environment. Urbanization has both positive and negative impacts on people's health and environment.

CAUSES OF URBANIZATION:

Economic, political, and social issues merge with circumstances of modernization to make people want to migrate from rural to urban areas.

CAUSES OF URBANIZATION INCLUDE;

- ❖ **INDUSTRIAL GROWTH:** The explosion of industrialization and manufacturing enterprises within a certain urban area gives rise to more employment opportunities — which is another factor of urbanization.
- ❖ **EMPLOYMENT:** Rural areas commonly are agricultural. Urbanization and industrial growth create opportunities for jobs that pay more, are more diverse, and may be less physically demanding.
- ❖ **SOCIAL FACTORS:** Many urban areas allow for better living standards, including superior educational facilities, better access to healthcare, modern housing, and more recreational activities.

- ❖ **Economic Problems:** Many people may choose to migrate from a world area, as it is generally not as economically stable or wealthy as a booming urban city.
- ❖ **Political Turmoil:** War, civil unrest, and other sources of political disorder often are woes of developing areas. This turbulence — and potential danger — can be enough to make anyone want to move.
- ❖ **Modernization:** New technology upgrades the infrastructure of urban areas. Better communication, medical facilities, and various social amenities can attract those from rural areas.

Urbanization is a complex process, as many of its driving factors play into and give rise to one another. Once a rural city becomes urbanized, it may begin to thrive from several beneficial features — most of which are what attracts more people to them.

POSITIVE EFFECTS OF URBANIZATION:

1. The urban population lives longer and have low infant mortality, better access to medical care, education, family planning, social services, environmental information compared to rural population.
2. Urban areas show decrease in birth rates among people which is usually 1/4th of that of rural areas.
3. Recycling is more economically feasible due to the presence of concentration of large population in an area which gives off recycling material whereas the per-capita, the expenditure on environment protection is higher in urban sector.
4. 50% of world's population lives in urban areas which occupy only 4% of total planet land.
5. The concentration of people in urban area helps to preserve biodiversity by reducing the stress on wild life habitats.
6. Industrialization paves the way for modern industries and will need more people to perform various jobs.
7. With modernization, cities can adapt to cultural needs and provide support systems for future development.
8. Industrialization coupled with modernization brings an ample amount of access for a city and the citizens within it. Accessibility to the Internet, better healthcare, education, recreational activities, social services, and more all improve liability. Additionally, modern cities have the potential to better plan their city for sustainability and boost their economy.
9. The very presence of the Internet and information technology can expand communication to nearly any corner of the globe, and has the capability to efficiently run utilities and lighting for a whole city.
10. The per-capital income of an individual in urban sector is almost double than the one who lives in rural area.

PROBLEMS OF URBANIZATION (NEGATIVE IMPACTS):

1. Although the urban develops and occupy only 4% of total Earth land, they consume 75% of Earth's resources.
2. To provide its dwellers with food, water, energy, minerals and other resources, large area of Earth is disturbed and degraded which in turn decreases the Earth's bio-diversity.
3. Because of their high resource consumption, the urban dwellers produce worlds maximum pollutants and hazardous substances.
4. The pollutants produced in large volumes cannot be easily degraded or dispersed and cannot be diluted as those produced in rural areas.
5. The population levels are higher in urban areas.
6. Most of the world's heavily populated cities do not have self-sustaining system because oh high resource input and high waste output.
7. High population density in urban area can lead to;
 - a) Increase in the spread of infectious diseases because of inadequate drinking water and poor sewage systems.
 - b) Increase in traffic, physical injuries, crime rate, industrial related problems when compared to rural areas.
 - c) To develop a more sustainable relation between city and living world, it becomes necessary to covert higher waste unsustainable city with linear metabolism (i.e., based on ever increasing resources) to a lower sustainable city with a circular metabolism (i.e., based on more efficient use-reuse-recycling of resources, prevention of pollution and reduction in output of wastes and hazardous wastes).
8. As population per unit area increases, local heating increases and availability of fresh air becomes very limited.
9. Due to over production in pollutants, it needs to be shifted to another area which causes depletion of resources in that area.
10. Most of the polluted cities in the world tend to receive acid rain due to dissolution of pollutants in rain water. This causes several health impacts like skin problems, breathing disorders etc.
11. Many urban cities have seen a population explosion that can be hard to plan for. As a result, employment opportunities may dry up quicker than expected — leading to unemployment.
12. Additionally, housing problems may arise with a very high population density and can lead to poor housing conditions. These housing conditions are only exacerbated by unemployment issues. Unemployment and poor housing (or, the unattainability of adequate housing) is creating an influx of crime in urban cities as well.
13. Water and sanitation issues are surfacing because of rapid population increases.
14. With so many people needing resources such as food, water, fuel, and waste management, the population of urbanized cities are suffering from

- a lower quality of life due to environmental reasons such as water scarcity, pollution, and sanitation.
15. This is leading to the spread of disease and poor health in heavily populated areas.
 16. The increasing conversion of rural land use into urban land use is a common phenomenon in most parts of the world because of perceived benefits of urban living as opposed to rural living. Urbanization involves the outward expansion of population centres beyond their original limits to accommodate a growing population.
 17. Urbanization results in irrevocable changes to the landscape, a shift in demographic patterns, and economic, social, and environmental impacts on a region.

GLOBALIZATION:

Globalization is the word used to describe the growing interdependence of the world's economies, cultures, and populations, brought about by cross-border trade in goods and services, technology, and flows of investment, people, and information.

Globalization means the speedup of movements and exchanges of human beings, goods, and services, capital, technologies or cultural practices all over the planet. One of the effects of globalization is that it promotes and increases interactions between different regions and populations around the globe.

According to **WHO [World Health Organization]**, globalization can be defined as **“the increased interconnectedness and interdependence of peoples and countries.”** It is generally understood to include two inter-related elements: the opening of international borders to increasingly fast flows of goods, services, finance, people and ideas; and the changes in institutions and policies at national and international levels that facilitate or promote such flows.

EXAMPLES OF GLOBALIZATION:

Because of trade developments and financial exchanges, we often think of globalization as an economic and financial phenomenon. Nonetheless, it includes a much wider field than just flowing of goods, services or capital. Often referred to as the globalization concept map, some examples of globalization are;

- **Economic globalization:** is the development of trade systems within transnational actors such as corporations or NGOs.

- **Financial globalization:** can be linked with the rise of a global financial system with international financial exchanges and monetary exchanges. Stock markets, for instance, are a great example of the financially connected global world since when one stock market has a decline, it affects other markets negatively as well as the economy as a whole.
- **Cultural globalization:** refers to the interpenetration of cultures which, as a consequence, means nations adopt principles, beliefs, and costumes of other nations, losing their unique culture to a unique, globalized supra-culture.
- **Political globalization:** the development and growing influence of international organizations such as the UN or WHO means governmental action takes place at an international level.
- **Sociological globalization:** information moves almost in real-time, together with the interconnection and interdependence of events and their consequences.
- **Technological globalization:** the phenomenon by which millions of people are interconnected. That is the power of the digital world via platforms such as Facebook, Instagram, Skype or You-tube.
- **Geographic globalization:** is the new organization and hierarchy of different regions of the world that is constantly changing. Moreover, with transportation and flying made so easy and affordable, apart from a few countries with demanding visas, it is possible to travel the world without barely any restrictions.
- **Ecological globalization:** accounts for the idea of considering planet Earth as a single global entity – a common good all societies should protect since the weather affects everyone and we are all protected by the same atmosphere. To this regard, it is often said that the poorest countries that have been polluting the least will suffer the most from climate change.

BENEFITS OF GLOBALIZATION:

- a) Exchange of resources becomes easy and the resource availability across the globe becomes common.
- b) The goods of high value can be exported and the financial well being of the country can be achieved.
- c) Introduction of new technologies stabilizes medical conditions of any country and good health care can be obtained. Ex: Introduction of technologies like MRI, PET has enabled easy diagnosis of diseases.
- d) Financial assistance for under developed and developing countries can be provided by developed countries.
- e) Globalization has paved a way for increase in telecommunication across the globe. Easy availability and easy access to internet has made life simple and better.

- f) The cultural exchange among countries has made many countries adopt the ancient principles and the mental, emotional health of people has stabilized. Ex: Ancient Indian books like Bhagavad-Gita, Ramayana and Mahabharata have been adopted over by more than 120 countries across the globe.
- g) Globalization has helped in introduction of new plant varieties which enables the exchange of plant diversity across the globe.
- h) Export value of essential commodities like Indian spices has gone up and have higher demand along different countries.
- i) Research field is opened and any new invention or discovery can be shared among different countries that are in need of it.
- j) Globally the financial stability is achieved if a country is globalizing.
- k) The places which have higher economic values (especially cities) are developed in maximum possible way.

NEGATIVE IMPACTS OF GLOBALIZATION:

- a) Globalization uses up finite resources more quickly.
- b) Globalization increases world carbon dioxide emissions.
- c) Globalization makes it virtually impossible for regulators in one country to foresee the worldwide implications of their actions.
- d) Globalization acts to increase world oil prices.
- e) Globalization transfers consumption of limited oil supply from developed countries to developing countries.
- f) Globalization transfers jobs from developed countries to less developed countries.
- g) Globalization transfers investment spending from developed countries to less developed countries.
- h) With the dollar as the world's reserve currency, globalization leads to huge US balance of trade deficits and other imbalances.
- i) Globalization tends to move taxation away from corporations, and onto individual citizens.
- j) Globalization sets up a currency "race to the bottom," with each country trying to get an export advantage by dropping the value of its currency.
- k) Globalization encourages dependence on other countries for essential goods and services.
- l) Globalization ties countries together, so that if one country collapses, the collapse is likely to ripple through the system, pulling many other countries with it.
- m) Due to mixing in population, the chances of introduction of new diseases are high. Ex: Ebola, COVID, etc
- n) Along with new plant species, few of the plant pathogens and plant weeds get introduced into a country.
- o) Cultural purity cannot be preserved as cultural mixing occurs.

- p) Exploitation of land and other resources happens in order to feel the global towns and cities.
- q) Due to introduction of telecommunication and enhancement in internet services, lots of birds and small animals are killed regularly.
- r) Under the banner of infrastructure development lots of environmental hazards are being created, deforestation is one such example.
- s) For the purpose of medical drug development, people in poor and under developed are being exploited. They are being used as testing vehicles.
- t) Due to introduction of new food variants, health of many children is under risk.
- u) When the industries are globalized, many people of native countries loose their job to other countries.
- v) Industrial globalization has paved way for many hazards in work place and also the number of accidents in work places have relatively went up.

HAZARDS:

A hazard is any source of potential damage, harm or adverse health effects on something or someone.

Basically, a hazard is the potential for harm or an adverse effect (for example, to people as health effects, to organizations as property or equipment losses, or to the environment).

Most hazards are dormant or potential, with only a theoretical risk of harm; however, once a hazard becomes "**active**," it can create an emergency situation. More directly, a hazard is a source of potential harm or negative outcome from past, current, or future exposures.

The term hazardous refers to a condition, circumstance, or combination of factors that create a substantial risk or danger of causing injury to persons or damage to property. It is typically used to describe substances and materials that are dangerous, including flammables, explosives, irritants, sensitizers, acids, and caustics, even when such materials may be relatively harmless in diluted concentrations.

In our discipline of occupational health and safety, the six primary hazard categories are:

- ✓ Physical hazards,
- ✓ Chemical hazards,
- ✓ Biological hazards,
- ✓ Radiological hazards,
- ✓ Ergonomic hazards,
- ✓ Behavioural hazards.

A **physical hazard** arises when use of a chemical is potentially dangerous due, for example, to the possibility of explosion, fire, or violent reaction with

water. Peroxides, sulfuric acid, diethyl ether, and phosphorus pentachloride are examples of chemical materials that present physical hazards. Often, such materials also present health hazards due to their toxicity. Physical hazards include treats at work place which are further studied under **occupational health hazards**.

A **chemical/substance** is a health hazard if it produces acute or chronic health effects in exposed individuals. Materials that are health hazards include carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, those which act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes.

Biohazards are infectious agents or hazardous biological materials that present a risk or potential risk to the health of humans, animals, or the environment. A **biological hazard** is one that is posed to humans by a biological organism or by a material produced by such an organism. The risk can be direct through infection or indirect through damage to the environment. Biohazardous materials include certain types of recombinant DNA; organisms and viruses infectious to humans, animals, or plants (e.g., parasites, viruses, bacteria, fungi, prions, rickettsia); and biologically active agents (i.e., toxins, allergens, venoms) that may cause disease in other living organisms or cause significant impact to the environment or community.

CHEMICAL HAZARDS IN DEVELOPING AND DEVELOPED COUNTRIES:

Chemical hazard generally refers to a type of occupational hazard caused by exposure to chemicals in the workplace. The hazard associated with a chemical depends on:

- What the specific chemical is,
- What chemical(s) it is mixed with, if any
- The relative proportion of the chemical, if it is in a mixture or solution with other substances and chemicals.

FEW OF THE WORLD'S WORST CHEMICAL DISASTERS ARE;

1. **Tianjin, China, explosions: 50 dead, more than 700 injured:** at least 50 people were killed and hundreds injured in a series of massive explosions at a warehouse where hazardous chemicals were stored in the Chinese port of Tianjin on Wednesday (Aug 17, 2015). The cause is not yet known, but the tragedy is the latest in a long and bloody history of industrial disasters that have killed thousands of people.
2. **Chornobyl disaster:** The worst nuclear power plant disaster in history happened on April 26, 1986, when an explosion at Reactor 4 of Ukraine's Chornobyl power plant spewed a cloud of radioactivity over Europe and

the Soviet Union. The explosion killed 31 people, but the long-term effects are still unknown. About 4,000 people, most of whom were children in 1986, developed thyroid cancer as a result of the incident. The United Nations estimated the death toll had climbed to 56 in 2005.

3. **Halifax explosion:** The deadliest industrial disaster in Canada happened on Dec. 6, 1917, when a French cargo ship loaded with wartime explosives collided with a Norwegian vessel in the Halifax Harbour, causing a massive explosion that devastated Halifax. About 2,000 people were killed and more than 9,000 injured by debris, fires and collapsing buildings.
4. **Centralia mining disaster:** On March 25, 1947, a coal mine near Centralia, exploded and killed 111 people. It happened when an explosive detonation ignited coal dust.
5. **Bhopal disaster:** Early on Dec. 3, 1984, a pesticide plant run by Union Carbide in Bhopal, India, spewed about 36 tonnes of deadly methyl isocyanate gas into the city's air, quickly killing about 4,000 people, according to local government estimates.
6. **Chlorine gas disaster:** The worst chlorine gas accident in the country occurred in 2005, when 18 freight train cars derailed and released 120,000 pounds of chlorine gas in the mill town of Graniteville, S.C. Nine people were killed and at least 1,400 people were exposed, resulting in more than 550 people treated at hospitals, including some with serious lung injuries. More than 5,000 people were evacuated from their homes.
7. **TEXAS CITY, TEXAS, US - April 16, 1947:** On the morning of April 16, 1947, a **French ship - The Grand camp** - was being loaded with ammonium nitrate (AN) fertilizer. With over 2,000 tonnes of AN onboard, a fire started in the hold. Not wanting to damage the cargo, the captain refused to use water on the flames and opted instead to control the fire using the steam system. The heat intensified and the ship exploded, killing crewmembers and showering onlookers with shrapnel. The blast was heard over 150 miles (240km) away.
8. **TEXAS CITY, TEXAS, US - March 23, 2005:** The 2005 disaster at **UK oil major BP's Texas City refinery, in Texas, US**, was considered the nation's worst industrial disaster in 15 years. A series of explosions occurred when a hydrocarbon isomerization unit was restarted and a distillation tower flooded with hydrocarbons. As a result, 15 were killed and another 180 were injured.
9. **SCHWEIZERHALLE, SWITZERLAND** - November 1, 1986: Water used to extinguish a major fire at the Sandoz chemical factory in 1986 washed chemicals into the river Rhine, one of Europe's busiest waterways. The spill caused severe pollution, which took years to eradicate, and killed an estimated 500,000 fishes.

BIOLOGICAL HAZARDS (in developed and developing countries):

The processes by which the organic origin components or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation is termed as biological hazard.

Common examples of biological hazards include:

- Malaria, Dengue fever
- Meningitis, influenza
- Pest infestations
- Zoonoses - HIV, H5N1 virus (Bird flu), H1N1 (Swine Flu), the plague, Anthrax, Cholera, Leptospirosis, COVID,
- Medical wastes - Used needles, medication that has expired etc.

Biologically hazardous substances might enter the place during population exchange among countries, laboratory testing or even might be introduced by other enemy countries and it might be termed as Bio-war.

RISK:

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss, or harmful effects on the environment. For example: the risk of developing cancer from smoking cigarettes could be expressed as, "cigarette smokers are 12 times (for example) more likely to die of lung cancer than non-smokers".

RISK ASSESSMENT/ANALYSIS:

Risk assessment is the process where;

- Identifying hazards and risk factors that have the potential to cause harm (hazard identification).
- Analyse and evaluate the risk associated with that hazard (risk analysis, and risk evaluation).
- Determine appropriate ways to eliminate the hazard, or control the risk when the hazard cannot be eliminated (risk control).

SCOPE OF RISK ASSESSMENT:

Risk assessments are very important as they form an integral part of an occupational health and safety management plan. They help to:

- Create awareness of hazards and risk.
- Identify who may be at risk (e.g., employees, cleaners, visitors, contractors, the public, etc.).
- Determine whether a control program is required for a particular hazard.
- Determine if existing control measures are adequate or if more should be done.
- Prevent injuries or illnesses, especially when done at the design or planning stage.
- Prioritize hazards and control measures.
- Meet legal requirements where applicable.

AIMS OF RISK ASSESSMENT:

The aim of the risk assessment process is to evaluate hazards, then remove that hazard or minimize the level of its risk by adding control measures, as necessary. By doing so, you have created a safer and healthier workplace.

The goal is to try to answer the following questions:

- What can happen and under what circumstances?
- What are the possible consequences?
- How likely are the possible consequences to occur?
- Is the risk controlled effectively, or is further action required?

WHEN SHOULD A RISK ASSESSMENT BE DONE?

There may be many reasons a risk assessment is needed, including:

- ❖ Before new processes or activities are introduced.
- ❖ Before changes are introduced to existing processes or activities, including when products, machinery, tools, equipment change or new information concerning harm becomes available.
- ❖ When hazards are identified.

STEPS IN RISK ASSESSMENT ARE:

- Step 1: **Identify the hazards.**
- Step 2: **Decide who might be harmed and how** (Determine the likelihood of harm, such as an injury or illness occurring, and its severity).
- Step 3: **Evaluate the risks and decide on precautions** (Identify actions necessary to eliminate the hazard, or control the risk using the hierarchy of risk control methods. Evaluate to confirm if the hazard has been eliminated or if the risk is appropriately controlled).
- Step 4: **Record your findings and implement them.** (Monitor to make sure the control continues to be effective).
- Step 5: **Review your risk assessment and update if required.** (Keep any documents or records that may be necessary. Documentation may

include detailing the process used to assess the risk, outlining any evaluations, or detailing how conclusions were made).

OCCUPATIONAL HEALTH:

The public health issue of occupational illness is a potential risk to the health of individuals exposed to an unhealthy environment. The Act for Occupational Health and Safety describes occupational hazard or illness as a condition arising from exposure to physical, chemical or biological agent in a workplace affecting normal physiological mechanisms and impairing health of the worker.

Occupational hazard is any material, processes, activities or situations that can result in accidents or diseases at the workplace. Occupational illness develops after long exposure to ergonomic hazards, disease-causing bacteria and viruses, chemicals or dust over a period of time because of unhygienic and unhealthy conditions at workplace. Occupational health i.e., musculoskeletal problems, blood borne diseases, tuberculosis, latex allergy, violence and work-related stress is neglected and considered a public health issue among healthcare workers in developing countries. Health problems among healthcare workers in hospitals can arise due to contact with chemicals and body fluids, accidents and absence of personal protective equipment. Occupational hazards among healthcare workers can largely be blamed on several issues within the healthcare system.

A safe and healthy work environment is the basic right of every worker, the global situation is not as observed. The ILO (International Labour Organisation) estimates that more than 130 million workers are victims of occupational accidents and diseased in a year. May be out of this, about 200 thousand workers may die, around 5-10 million become seriously disabled. With increase in world population, these figures are expected to rise significantly if the present situation continues in third world countries. 75% of global work forces work in third world countries which have many problems like poverty and unemployment which are the main reasons of least safety and health. There are about 800 million unemployed people in the third world countries.

The South Asian regions like India, Nepal, Srilanka, Bangladesh and Pakistan consist of lots of natural resources and gross domestic products. This work force represents more than 20% of world's working population. Such countries under influence of various economic institutions (World bank) have started to compete in exports. Liberalization of South Asian economies has opened market to global investors, who import hazardous industrial materials as well as new and advanced techniques.

Industrialization in South Asia focuses on production, but health and safety are given least priority. These investors with cheap labours and tax

concessions, get bypassed in health and safety authorities. The workers are denied the right of association because such associations are rarely accessible to the trade unions.

OCCUPATIONAL HEALTH IN INDIA:

India has very poor safety and health record. Lots of acts and rules exist in legislature to protect the workers' rights and their health but they are not implemented properly.

Only the best workers enjoy the benefits. Out of all work forces in India, only 8-9% are organised. Such work force is abundant, low skilled, easily available and the high rate of unemployment makes them susceptible to exploitation. Therefore, getting work done is more important than hazards involved.

The constitutional provision for occupational safety and health have number of articles. The constitution provides a broad frame work under which policies and programs for occupational health and safety could be established. They are;

1. **Article 24:** no child below the age of 15 years shall be employed to work in any factory or mine or engaged in hazardous employments.
2. **Article 39 (e, f):** the state shall in particular direct its policy towards securing;
39 e- that the health and strength of workers, men, women and tender age of children are not abused and that citizen are not forced for economic necessity to enter such occupation not suited for their age and strength.
39 f- that the children are given opportunity and facility to develop in healthy manner and in condition of freedom and dignity and childhood and youth are protected against exploitation.
3. **Article 42:** the state shall make provision for securing just and humane conditions of work and maternity relief.

NATIONAL LEGISLATURE:

It provides an essential foundation for the safety. Legislature should be reviewed and updated regularly because the scientific knowledge develops and gets updated regularly.

India has legislature on occupational health and safety from last 50 years or more. India was under British rule in 19th and early 20th century. Therefore, the laws and rules are based on British factory act. **The factory act of 1948** was amended time to time especially after Bhopal gas tragedy. The factory act came into existence on **1 December 1987**, which is said to deal the disaster and also to prevent the occurrence.

Factory act 1987 states that the employer;

- ❖ Should ensure cleanliness of work place
- ❖ Make effective arrangements for treatment and disposal of industrial effluents
- ❖ To make effective provision for adequate ventilation
- ❖ Maintenance of temperature to secure comfort of workers
- ❖ To remove any dust or fumes from work place which may be injurious or hazardous to the workers
- ❖ To prevent over crowding by maintaining a specific area for each worker
- ❖ Provide sufficient suitable light
- ❖ Clean drinking water suited conveniently for all the workers
- ❖ To provide suitable toilets of specific standards for males and females separately

The basic safety measures to be provided by employer are;

- Guards to provide suitable observation for all parts of dangerous machinery.
- Precautions for working on machinery.
- Emergency devices to cut off power.
- Maintenance of lifts, lifting machines, chains and ropes and other lifting equipment and pressured vessels.
- Walking surface area should be made of good construction.
- Provide protective equipment for workers.
- Measure to prevent the fires.

The factory owner must bring awareness to workers for the following information;

- Danger, health hazards and measure to protect themselves from manufactured, transported and store products.
- Safety policy.
- Quantity and characteristics and ways to dispose the wastes.
- Emergency plan should be known to the workers as well as to the public.
- Handling, using, transport and disposal of dangerous substances should be known.
- Maintenance of up-to-date health record of workers.
- Appointment of person who is experienced in handling hazardous substances.

All these laws should be enforced and chief factory inspector must supervise and record for the enforcement of such laws. A major problem in India is poor enforcement of these laws.

MINES' ACT:

Government of India has enforced mines' act to restrict the hazards at work place and provide safer environment for the workers.

- Minimum age of employment is 18.
- One day rest or leave per week.
- Limited working hours (8hours + 2 hours over time).
- No underground work for women.
- Provision of water and medical facilities.
- Constitution of committees to take care of the workers.
- No unsafe mine should be open for manual work by workers.
- Emergency plans.
- Notification on occupational diseases.

OCCUPATIONAL ACCIDENTS:

The International Labour Organisation (ILO) estimated that more than half of world occupational accidents occur in Asia-pacific region. Such accidents are under reported in India. In spite of that, the official figures shown in 1994, 25 injuries per 1000 workers in India. Comparison to this (1992), in Japan only 4 out of 1000 workers get injured and in Singapore 10 workers out of 1000. Lately lot of consideration and awareness has taken place in India and statistics show a good figure but again maximum accidents are under reported.

OCCUPATIONAL DISEASES:

Factory act requires notification of the occupational disease to government but they are hardly reported which allows the official statistics to compare with well industrialized countries. However, independent study reports the existence of many occupational diseases due to dust and fumes. Agriculture is India's largest employer. Workers are exposed to wide variety of dust and grains in fields.

The most common disease is byssinosis (lung disorder) caused by cotton dust in textile industries. Asthma and allergy are common among workers in tea production and grain production. Chronic lung diseases such as silicosis and pneumoconiosis are due to lead, chromium, pesticides exposed in factory and industries. Deafness which goes undiagnosed and unreported are commonly found in works like engineering, operation of heavy machinery, textile etc. very few doctors are available to diagnose such diseases and it can't be differentiated from tuberculosis.

WORKMEN'S COMPENSATION:

Two laws for compensating occupational diseases and accidents are;

- I. Workmen's compensation act and
- II. Employees' State Insurance (ESI).

The Workmen's Compensation Act offers compensation to workers and their dependents in case of injury or accident that may arise out of and in the course of employment resulting in disability or death. It helps an employer by covering the legal liability coverage, which may arise when one of its workers meets with an accident at the job place.

Some of the events covered under the act are:

- + Death,
- + Permanent total disablement,
- + Permanent partial disablement,
- + Temporary disablement,
- + Legal costs incurred if any.

This act applies to railway servants and to all people who are employed as per the Schedule II of the Act, which includes those who are working in mines, factories, construction sites and various other hazardous occupations.

Employees' State Insurance (abbreviated as **ESI**) is a self-financing social security and health insurance scheme for Indian workers. The fund is managed by the Employees' State Insurance Corporation (ESIC) according to rules and regulations stipulated in the **ESI Act 1948**. ESIC is a Statutory and an Autonomous Body under the Ministry of Labour and Employment, Government of India.

Employees' State Insurance Corporation (ESIC), established by ESI Act, is an autonomous corporation under Ministry of Labour and Employment, Government of India. As it is a legal entity, the corporation can raise loans and take measures for discharging such loans with the prior sanction of the central government and it can acquire both movable and immovable property and all incomes from the property shall vest with the corporation. The corporation can set up hospitals either independently or in collaboration with state government or other private entities, but most of the dispensaries and hospitals are run by concerned state governments.

BENEFITS:

- Medical benefit,
- Sickness benefit,
- Maternity benefit,
- Disablement benefit,
- Dependants benefit,
- Funeral expenses,

- Rehabilitation allowance.

OCCUPATIONAL HEALTH AND SAFETY INSTITUTIONS:

Two main institutions under the ministry of labour are;

1. Central Labour Institute, Mumbai (CLI) and
2. Regional Labour Institute, Kolkata, Kanpur and Chennai.

Institutes under ICMR (Indian Council for Medical Research) are;

1. National Institute of occupational health (NIOH), Ahmedabad and
2. Regional Institute of occupational health (RIOH), Kolkata, Bengaluru.

These institutes provide various support needed to the workers and continuous research is underway to reduce the hazards at work place.

VOLUNTARY ORGANISATIONS:

Since more Indian workers are unorganised, voluntary organisations play a vital role in highlighting their problems, bring awareness about health and safety so that ordinary workers and labours understand how to handle these issues. The voluntary organisations train the people and make them independent of those experts of industries.