

Pollution occurs when pollutants contaminate the natural surroundings; which brings about changes that affect our normal lifestyles adversely. Pollutants are the key elements or components of pollution which are generally waste materials of different forms. Pollution disturbs our ecosystem and the balance in the environment. With modernization and development in our lives pollution has reached its peak; giving rise to global warming and human illness.

Pollution occurs in different forms; air, water, soil, radioactive, noise, heat/ thermal and light. Every form of pollution has two sources of occurrence; the point and the non-point sources. The point sources are easy to identify, monitor and control, whereas the non-point sources are hard to control

Types & Causes of Pollution

Air Pollution is the most prominent and dangerous form of pollution. It occurs due to many reasons. Excessive burning of fuel which is a necessity of our daily lives for cooking, driving and other industrial activities; releases a huge amount of chemical substances in the air everyday; these pollute the air.

Smoke from chimneys, factories, vehicles or burning of wood basically occurs due to coal burning; this releases sulphur dioxide into the air making it toxic. The effects of air pollution are evident too. Release of sulphur dioxide and hazardous gases into the air causes global warming and acid rain; which in turn have increased temperatures, erratic rains and droughts worldwide; making it tough for the animals to survive. We breathe in every polluted particle from the air; result is increase in asthma and cancer in the lungs.

Water Pollution has taken toll of all the surviving species of the earth. Almost 60% of the species live in water bodies. It occurs due to several factors; the industrial wastes dumped into the rivers and other water bodies cause an imbalance in the water leading to its severe contamination and death of aquatic species. If you suspect that nearby water sources have been contaminated by a corporation then it might be a good idea to hire an expert to see your options.

Also spraying insecticides, pesticides like DDT on plants pollutes the ground water system and oil spills in the oceans have caused irreparable damage to the water bodies. Eutrophication is another big source; it

occurs due to daily activities like washing clothes, utensils near lakes, ponds or rivers; this forces detergents to go into water which blocks sunlight from penetrating, thus reducing oxygen and making it inhabitable.

Water pollution not only harms the aquatic beings but it also contaminates the entire food chain by severely affecting humans dependent on these. Water-borne diseases like cholera, diarrhoea have also increased in all places.

Soil pollution occurs due to incorporation of unwanted chemicals in the soil due to human activities. Use of insecticides and pesticides absorbs the nitrogen compounds from the soil making it unfit for plants to derive nutrition from. Release of industrial waste, mining and deforestation also exploits the soil. Since plants can't grow properly, they can't hold the soil and this leads to soil erosion.

Noise pollution is caused when noise which is an unpleasant sound affects our ears and leads to psychological problems like stress, hypertension, hearing impairment, etc. It is caused by machines in industries, loud music, etc.

Radioactive pollution is highly dangerous when it occurs. It can occur due to nuclear plant malfunctions, improper nuclear waste disposal, accidents, etc. It causes cancer, infertility, blindness, defects at the time of birth; can sterilise soil and affect air and water.

Thermal/heat pollution is due to the excess heat in the environment creating unwanted changes over long time periods; due to huge number of industrial plants, deforestation and air pollution. It increases the earth's temperature, causing drastic climatic changes and extinction of wildlife.

Light pollution occurs due to prominent excess illumination of an area. It is largely visible in big cities, on advertising boards and billboards, in sports or entertainment events at the night. In residential areas the lives of the inhabitants is greatly affected by this. It also affects the astronomical observations and activities by making the stars almost invisible.

Effects of Pollution

1. Environment Degradation : Environment is the first casualty for increase in pollution whether in air or water. The increase in the amount of CO₂ in the atmosphere leads to smog which can restrict sunlight from reaching the earth. Thus, preventing plants in the process of photosynthesis. Gases like Sulfur dioxide and nitrogen oxide can cause acid rain. Water pollution in terms of Oil spill may lead to death of several wildlife species.

2. Human Health : The decrease in quality of air leads to several respiratory problems including asthma or lung cancer. Chest pain, congestion, throat inflammation, cardiovascular disease, respiratory disease are some of the diseases that can be caused by air pollution. Water pollution occurs due to contamination of water and may pose skin-related problems including skin irritations and rashes. Similarly, Noise pollution leads to hearing loss, stress and sleep disturbance.

3. Global Warming : The emission of greenhouse gases particularly CO₂ is leading to global warming. Every other day new industries are being set up, new vehicles come on roads and trees are cut to make way for new homes. All of them, in direct or indirect way lead to an increase in CO₂ in the environment. The increase in CO₂ leads to melting of polar ice caps which increases the sea level and poses danger for the people living near coastal areas.

4. Ozone Layer Depletion : Ozone layer is the thin shield high up in the sky that stops ultra violet rays from reaching the earth. As a result of human activities, chemicals, such as chlorofluorocarbons (CFCs), were released into the atmosphere which contributed to the depletion of ozone layer.

5. Infertile Land : Due to constant use of insecticides and pesticides, the soil may become infertile. Plants may not be able to grow properly. Various forms of chemicals produced from industrial waste are released into the flowing water which also affects the quality of soil.

Pollution not only affects humans by destroying their respiratory, cardiovascular and neurological systems; it also affects nature, plants, fruits, vegetables, rivers, ponds, forests, animals, etc., on which they are highly dependent for survival. It is crucial to control pollution as nature, wildlife and human life are precious gifts to mankind.

Air Pollution

Air pollution is one such form that refers to the contamination of the air, irrespective of indoors or outside. A physical, biological or chemical alteration to the air in the atmosphere can be termed as pollution. It occurs when any harmful gases, dust, smoke enter into the atmosphere and make it difficult for plants, animals and humans to survive as the air becomes dirty.

Air pollution can further be classified into two sections- Visible air pollution and invisible air pollution. Another way of looking at Air pollution could be any substance that holds the potential to hinder the atmosphere or the well-being of the living beings surviving in it. The sustenance of all things living is due to

a combination of gases that collectively form the atmosphere; the imbalance caused by the increase or decrease of the percentage of these gases can be harmful for survival.

.The Ozone layer considered crucial for the existence of the ecosystems on the planet is depleting due to increased pollution. Global warming, a direct result of the increased imbalance of gases in the atmosphere has come to be known as the biggest threat and challenge that the contemporary world has to overcome in a bid for survival.

Types of Pollutants

In order to understand the causes of Air pollution, several divisions can be made. Primarily air pollutants can be caused by primary sources or secondary sources. The pollutants that are a direct result of the process can be called primary pollutants. A classic example of a primary pollutant would be the sulfur-dioxide emitted from factories

Secondary pollutants are the ones that are caused by the inter mingling and reactions of primary pollutants. Smog created by the interactions of several primary pollutants is known to be as secondary pollutant.

Causes of Air pollution

1. Burning of Fossil Fuels : Sulfur dioxide emitted from the combustion of fossil fuels like coal, petroleum and other factory combustibles is one the major cause of air pollution. Pollution emitting from vehicles including trucks, jeeps, cars, trains, airplanes cause immense amount of pollution. We rely on them to fulfill our daily basic needs of transportation. But, there overuse is killing our environment as dangerous gases are polluting the environment. Carbon Monoxide caused by improper or incomplete combustion and generally emitted from vehicles is another major pollutant along with Nitrogen Oxides, that is produced from both natural and man made processes.

2. Agricultural activities : Ammonia is a very common by product from agriculture related activities and is one of the most hazardous gases in the atmosphere. Use of insecticides, pesticides and fertilizers in agricultural activities has grown quite a lot. They emit harmful chemicals into the air and can also cause water pollution.

3. Exhaust from factories and industries : Manufacturing industries release large amount of carbon monoxide, hydrocarbons, organic compounds, and chemicals into the air thereby depleting the quality of air. Manufacturing industries can be found at every corner of the earth and there is no area that has not

been affected by it. Petroleum refineries also release hydrocarbons and various other chemicals that pollute the air and also cause land pollution.

4. Mining operations : Mining is a process wherein minerals below the earth are extracted using large equipments. During the process dust and chemicals are released in the air causing massive air pollution. This is one of the reason which is responsible for the deteriorating health conditions of workers and nearby residents.

5. Indoor air pollution : Household cleaning products, painting supplies emit toxic chemicals in the air and cause air pollution. Have you ever noticed that once you paint walls of your house, it creates some sort of smell which makes it literally impossible for you to breathe.

Suspended particulate matter popular by its acronym SPM, is another cause of pollution. Referring to the particles afloat in the air, SPM is usually caused by dust, combustion etc.

Effects of Air pollution

1. Respiratory and heart problems : The effects of Air pollution are alarming. They are known to create several respiratory and heart conditions along with Cancer, among other threats to the body. Several millions are known to have died due to direct or indirect effects of Air pollution. Children in areas exposed to air pollutants are said to commonly suffer from pneumonia and asthma.

2. Global warming : Another direct effect is the immediate alterations that the world is witnessing due to Global warming. With increased temperatures world wide, increase in sea levels and melting of ice from colder regions and icebergs, displacement and loss of habitat have already signaled an impending disaster if actions for preservation and normalization aren't undertaken soon.

3. Acid Rain : Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. When it rains, the water droplets combines with these air pollutants, becomes acidic and then falls on the ground in the form of acid rain. Acid rain can cause great damage to human, animals and crops.

4. Eutrophication : Eutrophication is a condition where high amount of nitrogen present in some pollutants gets developed on sea's surface and turns itself into algae and and adversely affect fish, plants and animal species. The green colored algae that is present on lakes and ponds is due to presence of this chemical only.

5. Effect on Wildlife : Just like humans, animals also face some devastating affects of air pollution. Toxic chemicals present in the air can force wildlife species to move to new place and change their habitat. The toxic pollutants deposit over the surface of the water and can also affect sea animals.

6. Depletion of Ozone layer : Ozone exists in earth's stratosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth's ozone layer is depleting due to the presence of chlorofluorocarbons, hydro chlorofluorocarbons in the atmosphere. As ozone layer will go thin, it will emit harmful rays back on earth and can cause skin and eye related problems. UV rays also have the capability to affect crops.

There are two types of sources : **Natural sources and Man-made sources.**

Natural sources of pollution include dust carried by the wind from locations with very little or no green cover, gases released from the body processes of living beings (Carbon dioxide from humans during respiration, Methane from cattle during digestion, Oxygen from plants during Photosynthesis). Smoke from the combustion of various inflammable objects, volcanic eruptions etc along with the emission of polluted gases also make it to the list of Natural sources of Pollution.

While looking at the man-made contributions towards air pollution, smoke again features as a prominent component. The smoke emitted from various forms of combustion like in bio mass, factories, vehicles, furnaces etc. Waste used to create landfills generate methane, that is harmful in several ways. The reactions of certain gases and chemicals also form harmful fumes that can be dangerous to the well being of living creatures.

Solutions for Air Pollution

1. Use public mode of transportation : Encourage people to use more and more public modes of transportation to reduce pollution. Also, try to make use of car pooling. If you and your colleagues come from the same locality and have same timings you can explore this option to save energy and money.

2. Conserve energy : Switch off fans and lights when you are going out. Large amount of fossil fuels are burnt to produce electricity. You can save the environment from degradation by reducing the amount of fossil fuels to be burned.

3. Understand the concept of Reduce, Reuse and Recycle : Do not throw away items that are of no use to you. In-fact reuse them for some other purpose. For e.g. you can use old jars to store cereals or pulses.

4. Emphasis on clean energy resources : Clean energy technologies like solar, wind and geothermal are on high these days. Governments of various countries have been providing grants to consumers who are interested in installing solar panels for their home. This will go a long way to curb air pollution.

5. Use energy efficient devices : CFL lights consume less electricity as against their counterparts. They live longer, consume less electricity, lower electricity bills and also help you to reduce pollution by consuming less energy.

Several attempts are being made world wide on a personal, industrial and governmental levels to curb the intensity at which Air Pollution is rising and regain a balance as far as the proportions of the foundation gases are concerned. This is a direct attempt at slacking Global warming. We are seeing a series of innovations and experiments aimed at alternate and unconventional options to reduce pollutants. Air Pollution is one of the larger mirrors of man's follies, and a challenge we need to overcome to see a tomorrow.

Water Pollution

Water they say is life, and indeed they were right. With about 70% of the earth's cover being water, it undeniably becomes one of our greatest resources. It is an important element in both domestic as well as industrial purposes. Infested with waste ranging from floating plastic bags to chemical waste, our water bodies have turned into a pool of poison. The contamination of water bodies in simplest words means water pollution. Thereby the abuse of lakes, ponds, oceans, rivers, reservoirs etc is water pollution. Pollution of water occurs when substances that will modify the water in negative fashion are discharged in it. This discharge of pollutants can be direct as well as indirect.

Water pollution is an appalling problem, powerful enough to lead the world on a path of destruction. Water is an easy solvent, enabling most pollutants to dissolve in it easily and contaminate it. The most basic effect of water pollution is directly suffered by the organisms and vegetation that survive in water, including amphibians. On a human level, several people die each day due to consumption of polluted and infected water. Water is polluted by both natural as well as man-made activities. Volcanic eruptions, earthquakes, Tsunamis etc are known to alter water and contaminate it, also affecting ecosystems that survive under water.

Sources of Water Pollution

There are various classifications of water pollution. The two chief sources of water pollution can be seen as Point and Non Point.

Point refer to the pollutants that belong to a single source. An example of this would be emissions from factories into the water.

Non Point on the other hand means pollutants emitted from multiple sources. Contaminated water after rains that has traveled through several regions may also be considered as a Non point source of pollution.

Causes of Water Pollution.

1. Industrial waste : Industries produce huge amount of waste which contains toxic chemicals and pollutants which can cause air pollution and damage to us and our environment. They contain pollutants such as lead, mercury, sulphur, asbestos, nitrates and many other harmful chemicals. Many industries do not have proper waste management system and drain the waste in the fresh water which goes into rivers, canals and later in to sea. The toxic chemicals have the capability to change the color of water, increase the amount of minerals, also known as Eutrophication, change the temperature of water and pose serious hazard to water organisms.

2. Sewage and waste water : The sewage and waste water that is produced by each household is chemically treated and released in to sea with fresh water. The sewage water carries harmful bacteria and chemicals that can cause serious health problems. Pathogens are known as a common water pollutant; The sewers of cities house several pathogens and thereby diseases. Microorganisms in water are known to be causes of some very deadly diseases and become the breeding grounds for other creatures that act like carriers. These carriers inflict these diseases via various forms of contact onto an individual. A very common example of this process would be Malaria.

3. Mining activities : Mining is the process of crushing the rock and extracting coal and other minerals from underground. These elements when extracted in the raw form contains harmful chemicals and can increase the amount of toxic elements when mixed up with water which may result in health problems. Mining activities emit several metal waste and sulphides from the rocks and is harmful for the water.

4. Marine dumping : The garbage produce by each household in the form of paper, aluminum, rubber, glass, plastic, food if collected and deposited into the sea in some countries. These items take from 2 weeks to 200 years to decompose. When such items enters the sea, they not only cause water pollution but also harm animals in the sea.

5. Accidental Oil leakage : Oil spill pose a huge concern as large amount of oil enters into the sea and does not dissolve with water; there by opens problem for local marine wildlife such as fish, birds and sea

otters. For e.g.: a ship carrying large quantity of oil may spill oil if met with an accident and can cause varying damage to species in the ocean depending on the quantity of oil spill, size of ocean, toxicity of pollutant.

6. Burning of fossil fuels : Fossil fuels like coal and oil when burnt produce substantial amount of ash in the atmosphere. The particles which contain toxic chemicals when mixed with water vapor result in acid rain. Also, carbon dioxide is released from burning of fossil fuels which result in global warming.

7. Chemical fertilizers and pesticides : Chemical fertilizers and pesticides are used by farmers to protect crops from insects and bacterias. They are useful for the plants growth. However, when these chemicals are mixed up with water produce harmful for plants and animals. Also, when it rains, the chemicals mixes up with rainwater and flow down into rivers and canals which pose serious damages for aquatic animals.

8. Leakage from sewer lines : A small leakage from the sewer lines can contaminate the underground water and make it unfit for the people to drink. Also, when not repaired on time, the leaking water can come on to the surface and become a breeding ground for insects and mosquitoes.

9. Global warming : An increase in earth's temperature due to greenhouse effect results in global warming. It increases the water temperature and result in death of aquatic animals and marine species which later results in water pollution.

10. Radioactive waste : Nuclear energy is produced using nuclear fission or fusion. The element that is used in production of nuclear energy is Uranium which is highly toxic chemical. The nuclear waste that is produced by radioactive material needs to be disposed off to prevent any nuclear accident. Nuclear waste can have serious environmental hazards if not disposed off properly. Few major accidents have already taken place in Russia and Japan.

11. Urban development : As population has grown, so has the demand for housing, food and cloth. As more cities and towns are developed, they have resulted in increase use of fertilizers to produce more food, soil erosion due to deforestation, increase in construction activities, inadequate sewer collection and treatment, landfills as more garbage is produced, increase in chemicals from industries to produce more materials.

12. Leakage from the landfills : Landfills are nothing but huge pile of garbage that produces awful smell and can be seen across the city. When it rains, the landfills may leak and the leaking landfills can pollute the underground water with large variety of contaminants.

13. Animal waste : The waste produce produce by animals is washed away into the rivers when it rains. It gets mixed up with other harmful chemicals and causes various water borne diseases like cholera, diarrhea, jaundice, dysentery and typhoid.

14. Underground storage leakage : Transportation of coal and other petroleum products through underground pipes is well known. Accidentals leakage may happen anytime and may cause damage to environment and result in soil erosion.

Water pollutants also include both organic and inorganic factors. Organic factors include volatile organic compounds, fuels, waste from trees, plants etc. Inorganic factors include ammonia, chemical waste from factories, discarded cosmetics etc. The water that travels via fields is usually contaminated with all forms of waste inclusive of fertilizers that it swept along the way. This infected water makes its way to our water bodies and sometimes to the seas endangering the flora, fauna and humans that use it along its path.

The current scenario has led to a consciousness about water preservation and efforts are being made on several levels to redeem our water resources. Industries and factory set-up's are restricted from contaminating the water bodies and are advised to treat their contaminated waste through filtration methods. People are investing in rain water harvesting projects to collect rainwater and preserve it in wells below ground level.

Water Pollution is common, and is an area of high alert. Water needs to be preserved and respected today, for us to live a tomorrow.

Land Pollution

When we talk about air or water pollution, the reactions garnered are stronger. This is because we can see the effects caused by the pollutants and their extent very clearly. We may not be able to see the effects with clarity, but land is being polluted and abused constantly and we are unable to calculate the damages incurred. Land Pollution has come to become one of the serious concerns that we collectively battle.

Land pollution, in other words, means degradation or destruction of earth's surface and soil, directly or indirectly as a result of human activities. Anthropogenic activities are conducted citing development, and

the same affects the land drastically, we witness land pollution; by drastic we are referring to any activity that lessens the quality and/or productivity of the land as an ideal place for agriculture, forestation, construction etc. The degradation of land that could be used constructively in other words is land pollution.

Land Pollution has led to a series of issues that we have come to realize in recent times, after decades of neglect. The increasing numbers of barren land plots and the decreasing numbers of forest cover is at an alarming ratio. Moreover the extension of cities and towns due to increasing population is leading to further exploitation of the land. Land fills and reclamations are being planned and executed to meet the increased demand of lands. This leads to further deterioration of land, and pollution caused by the land fill contents. Also due to the lack of green cover, the land gets affected in several ways like soil erosion occurs washing away the fertile portions of the land. Or even a landslide can be seen as an example.

Causes of Land Pollution

1. Deforestation and soil erosion : Deforestation carried out to create dry lands is one of the major concerns. Land that is once converted into a dry or barren land, can never be made fertile again, whatever the magnitude of measures to redeem it are. Land conversion, meaning the alteration or modification of the original properties of the land to make it use-worthy for a specific purpose is another major cause. This hampers the land immensely. Also there is a constant waste of land. Unused available land over the years turns barren; this land then cannot be used. So in search of more land, potent land is hunted and its indigenous state is compromised with.

2. Agricultural activities : With growing human population, demand for food has increased considerably. Farmers often use highly toxic fertilizers and pesticides to get rid off insects, fungi and bacteria from their crops. However with the overuse of these chemicals, they result in contamination and poisoning of soil.

3. Mining activities : During extraction and mining activities, several land spaces are created beneath the surface. We constant hear about land caving in; this is nothing but nature's way of filling the spaces left out after mining or extraction activity.

4. Overcrowded landfills : Each household produces tonnes of garbage each year. Garbage like aluminum, plastic, paper, cloth, wood is collected and sent to the local recycling unit. Items that can not be recycled become a part of the landfills that hampers the beauty of the city and cause land pollution.

5. Industrialization : Due to increase in demand for food, shelter and house, more goods are produced. This resulted in creation of more waste that needs to be disposed of. To meet the demand of the growing

population, more industries were developed which led to deforestation. Research and development paved the way for modern fertilizers and chemicals that were highly toxic and led to soil contamination.

6. Construction activities : Due to urbanization, large amount of construction activities are taking place which has resulted in large waste articles like wood, metal, bricks, plastic that can be seen by naked eyes outside any building or office which is under construction.

7. Nuclear waste : Nuclear plants can produce huge amount of energy through nuclear fission and fusion. The left over radioactive material contains harmful and toxic chemicals that can affect human health. They are dumped beneath the earth to avoid any casualty.

8. Sewage treatment : Large amount of solid waste is leftover once the sewage has been treated. The leftover material is sent to landfill site which end up in polluting the environment.

Effects of Land Pollution

1. Soil pollution : Soil pollution is another form of land pollution, where the upper layer of the soil is damaged. This is caused by the overuse of chemical fertilizers, soil erosion caused by running water and other pest control measures; this leads to loss of fertile land for agriculture, forest cover, fodder patches for grazing etc.

2. Change in climate patterns : The effects of land pollution are very hazardous and can lead to the loss of ecosystems. When land is polluted, it directly or indirectly affects the climate patterns.

3. Environmental Impact : When deforestation is committed, the tree cover is compromised on. This leads to a steep imbalance in the rain cycle. A disturbed rain cycle affects a lot of factors. To begin with, the green cover is reduced. Trees and plants help balance the atmosphere, without them we are subjected to various concerns like Global warming, the green house effect, irregular rainfall and flash floods among other imbalances.

4. Effect on human health : The land when contaminated with toxic chemicals and pesticides lead to problem of skin cancer and human respiratory system. The toxic chemicals can reach our body through foods and vegetables that we eat as they are grown in polluted soil.

5. Cause Air pollution : Landfills across the city keep on growing due to increase in waste and are later burned which leads to air pollution. They become home for rodents, mice etc which in turn transmit diseases.

6. Distraction for Tourist : The city loses its attraction as a tourist destination as landfills do not look good when you move around the city. It leads to loss of revenue for the state government.

7. Effect on wildlife : The animal kingdom has suffered mostly in the past decades. They face a serious threat with regards to loss of habitat and natural environment. The constant human activity on land, is leaving it polluted; forcing these species to move further away and adapt to new regions or die trying to adjust. Several species are pushed to the verge of extinction, due to no homeland.

Other issues that we face include increased temperature, unseasonal weather activity, acid rains etc. The discharge of chemicals on land, makes it dangerous for the ecosystem too. These chemicals are consumed by the animals and plants and thereby make their way in the ecosystem. This process is called bio magnification and is a serious threat to the ecology.

Solutions for Land Pollution

1. Make people aware about the concept of Reduce, Recycle and Reuse.
2. Reduce the use of pesticides and fertilizers in agricultural activities.
3. Avoid buying packaged items as they will lead to garbage and end up in landfill site.
4. Ensure that you do not litter on the ground and do proper disposal of garbage.
5. Buy biodegradable products.
6. Do Organic gardening and eat organic food that will be grown without the use of pesticides.
7. Create dumping ground away from residential areas.

IMPORTANT GLOBAL CONVENTIONS

International Convention for the Prevention of Pollution from Ships

The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 is one of the most important international marine environmental conventions

MARPOL includes regulations aimed at preventing and minimising, both accidental and operational, pollution from ships and currently includes six technical Annexes:

- Annex I – Regulations for the Prevention of Pollution by Oil
- Annex II – Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk

- Annex III – Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form

Minamata Convention

Minamata Convention on Mercury

The Minamata Convention on Mercury is an international treaty designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. This Convention was a result of three years of meeting and negotiating, after which the text of the Convention was approved by delegates representing close to 140 countries on 19 January 2013 in Geneva and adopted and signed later that year on 10 October 2013 at a Diplomatic Conference held in Kumamoto, Japan. The Convention is named after the Japanese city Minamata. This naming is of symbolic importance as the city went through a devastating incident of mercury poisoning. It is expected that over the next few decades, this international agreement will enhance the reduction of mercury pollution from the targeted activities responsible for the major release of mercury to the immediate environment.

The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, usually known as the Basel Convention, is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.

Stockholm Convention on Persistent Organic Pollutants

Stockholm Convention on Persistent Organic Pollutants is an international environmental treaty, signed in 2001 and effective from May 2004, that aims to eliminate or restrict the production and use of persistent organic pollutants (POPs).

In 1995, the Governing Council of the United Nations Environment Programme (UNEP) called for global action to be taken on POPs, which it defined as “chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment”

THE GREAT PACIFIC GARBAGE PATCH

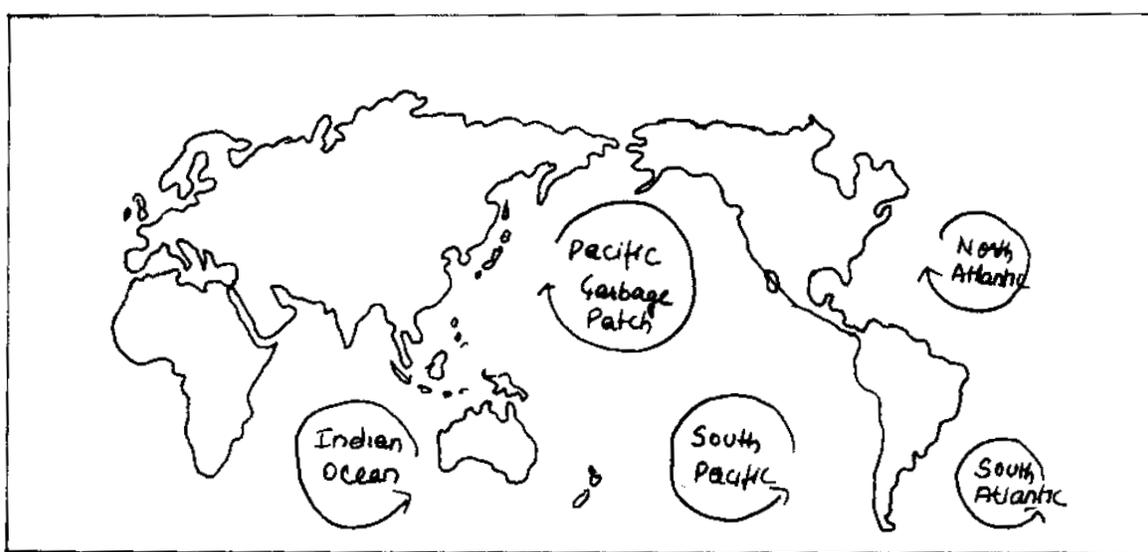
The Great Pacific Garbage Patch (GPGP) is the largest of the five offshore plastic accumulation zones in the world's oceans. It is located halfway between Hawaii and California.

PLASTIC ACCUMULATION

It is estimated that 1.15 to 2.41 million tonnes of plastic are entering the ocean each year from rivers. More than half of this plastic is less dense than the water, meaning that it will not sink once it encounters the sea.

The stronger, more buoyant plastics show resiliency in the marine environment, allowing them to be transported over extended distances. They persist at the sea surface as they make their way offshore, transported by converging currents and finally accumulating in the patch.

Once these plastics enter the gyre, they are unlikely to leave the area until they degrade into smaller microplastics under the effects of sun, waves and marine life. As more and more plastics are discarded into the environment, microplastic concentration in the Great Pacific Garbage Patch will only continue to increase.



ESTIMATION OF SIZE

The GPGP covers an estimated surface area of 1.6 million square kilometers, an area twice the size of Texas or three times the size of France.

To formulate this number, the team of scientists behind this research conducted the most elaborate sampling method ever coordinated.

At the time of sampling there were more than 1.8 trillion pieces of plastic in the patch that weigh an estimated 80,000 tonnes. These figures are much higher than previous calculations.

The vast majority of plastics retrieved were made of rigid or hard polyethylene (PE) or polypropylene (PP), or derelict fishing gear (nets and ropes particularly). Ranging in size from small fragments to larger objects and meter-sized fishing nets.

SIZE CLASSES Plastic within the patch was categorized into four size classes:

- Microplastics (0.05 - 0.5 cm)
- Mesoplastics (0.5 – 5 cm)
- Macroplastics (5 – 50 cm)
- Megaplastics (anything above 50 cm)

Not only does plastic pollution in the Great Pacific Garbage Patch pose risks for the safety and health of marine animals, but there are health and economic implications for humans as well.

IMPACT ON WILDLIFE Plastic has increasingly become a ubiquitous substance in the ocean. Due to its size and color, animals confuse the plastic for food, causing malnutrition; it poses entanglement risks and threatens their overall behavior, health and existence.

Studies have shown that about 700 species have encountered marine debris, and 92% of these interactions are with plastic. 17% of the species affected by plastic are on the IUCN (International Union for Conservation of Nature) Red List of Threatened Species

IMPACT ON HUMANS AND SOCIETY Once plastic enters the marine food web, there is a possibility that it will contaminate the human food chain as well. Efforts to clean and eradicate ocean plastic have also caused significant financial burdens.

Affects the Human Food chain Through a process called bioaccumulation, chemicals in plastics will enter the body of the animal feeding on the plastic, and as the feeder becomes prey, the chemicals will pass to the predator - making their way up the food web that includes humans. These chemicals that affected the plastic feeders could then be present within the human as well.

THE CENTRAL POLLUTION CONTROL BOARD (CPCB)

CPCB is statutory organisation, was constituted in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974. Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. It serves as a field formation and also provides technical services to the Ministry of Environment and Forests of the provisions of the Environment (Protection) Act, 1986. Principal Functions of the CPCB, as spelt out in the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981, are

- (i) to promote cleanliness of streams and wells in different areas of the States by prevention, control and abatement of water pollution, and
- (ii) to improve the quality of air and to prevent, control or abate air pollution in the country.

Water (Prevention and Control of Pollution) Act, 1974

Fresh water is a finite resource essential for use in agriculture, industry, propagation of wildlife & fisheries and for human existence. India is a riverine country. It has 14 major rivers, 44 medium rivers and 55 minor rivers besides numerous lakes, ponds and wells which are used as primary source of drinking water even without treatment. Most of the rivers being fed by monsoon rains, which is limited to only three months of the year, run dry throughout the rest of the year often carrying wastewater discharges from industries or cities/towns endangering the quality of our scarce water resources. The parliament of India in its wisdom enacted the Water (Prevention and Control of Pollution) Act, 1974 with a view to maintaining and restoring wholesomeness of our water bodies. One of the mandates of CPCB is to collect, collate and disseminate technical and statistical data relating to water pollution. Hence, **Water Quality Monitoring (WQM)** and Surveillance are of utmost importance. CPCB has been assigned following functions at National Level :

- Advise the Central Government on any matter concerning prevention and control of water and air pollution and improvement of the quality of air;
- Plan and cause to be executed a nationwide programme for the prevention, control or abatement of water and air pollution;
- Coordinate the activities of the State Boards and resolve disputes among them; Provide technical assistance and guidance to the State Boards, carry out and sponsor investigations and research relating to problems of water and air pollution, and for their prevention, control or abatement;

- Plan and organise training of persons engaged in programmes for prevention, control or abatement of water and air pollution;
- Organise through mass media, a comprehensive mass awareness programme on prevention, control or abatement of water and air pollution;
- Collect, compile and publish technical and statistical data relating to water and air pollution and the measures devised for their effective prevention, control or abatement;
- Prepare manuals, codes and guidelines relating to treatment and disposal of sewage and trade effluents as well as for stack gas cleaning devices, stacks and ducts;
- Disseminate information in respect of matters relating to water and air pollution and their prevention and control;
- Lay down, modify or annul, in consultation with the State Governments concerned, the standards for stream or well, and lay down standards for the quality of air; • Establish or recognize laboratories to enable the Board to perform, and; • Perform such other functions as and when prescribed by the Government of India.

RIVER STRETCHES FOR RESTORATION OF WATER QUALITY Central Pollution Control Board is monitoring 445 rivers in 29 States and 6 Union Territories in the country. The monitored data is analyzed statistically and compared with the water quality criteria. The stretches of rivers not meeting with the criteria are identified as polluted stretches and categorized in five priority classes.

Based on BOD concentration stretches consistently exceeding to BOD levels >30 mg/l are categorised as Priority Class-I,

- BOD between 20 & 30 mg/l as Priority Class - II,
- BOD between 10 & 20mg/l as Priority Class-III,
- BOD between 6-10 mg/l as Priority Class –IV and
- BOD between 3 & 6 mg/l as Priority Class- V.

Groundwater Quality Monitoring Groundwater monitoring during the period 2014-15 was conducted at identified locations in Unnao, Varanasi, Kanpur & Allahabad districts. Total 68 samples were collected from Unnao, Sitapur, Varanasi, Raibareli, Unchahhar, Shajahanpur, Bareilly, Kanpur, Pilibhit, Allahabad & Chandauli. It was observed that the overall groundwater quality is not satisfactory with respect to electrical conductivity, TDS, total hardness, magnesium, turbidity and total hardness.

‘**Namami Gange Programme**’, is an Integrated Conservation Mission, approved as ‘Flagship Programme’ by the Union Government in June 2014 with budget outlay of Rs.20,000 Crore to accomplish the twin objectives of effective abatement of pollution, conservation and rejuvenation of National River Ganga.

Main pillars of the Namami Gange Programme are:-

Sewerage Treatment Infrastructure

River-Front Development

River-Surface Cleaning

Bio-Diversity

Afforestation

Public Awareness

Industrial Effluent Monitoring

Ganga Gram

Its implementation has been divided into Entry-Level Activities (for immediate visible impact), Medium-Term Activities (to be implemented within 5 years of time frame) and Long-Term Activities (to be implemented within 10 years).

The key achievements under Namami Gange programme are:-

Creating Sewerage Treatment Capacity :- 63 sewerage management projects under implementation in the States of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal. 12 new sewerage management Projects Launched in these states. Work is under construction for creating Sewerage capacity of 1187.33 (MLD). Hybrid Annuity PPP Model based two projects has been initiated for Jagjeetpur, Haridwar and Ramanna, Varanasi.

Creating River-Front Development :- 28 River-Front Development projects and 33 Entry level Projects for construction, modernization and renovation of 182 Ghats and 118 crematoria has been initiated.

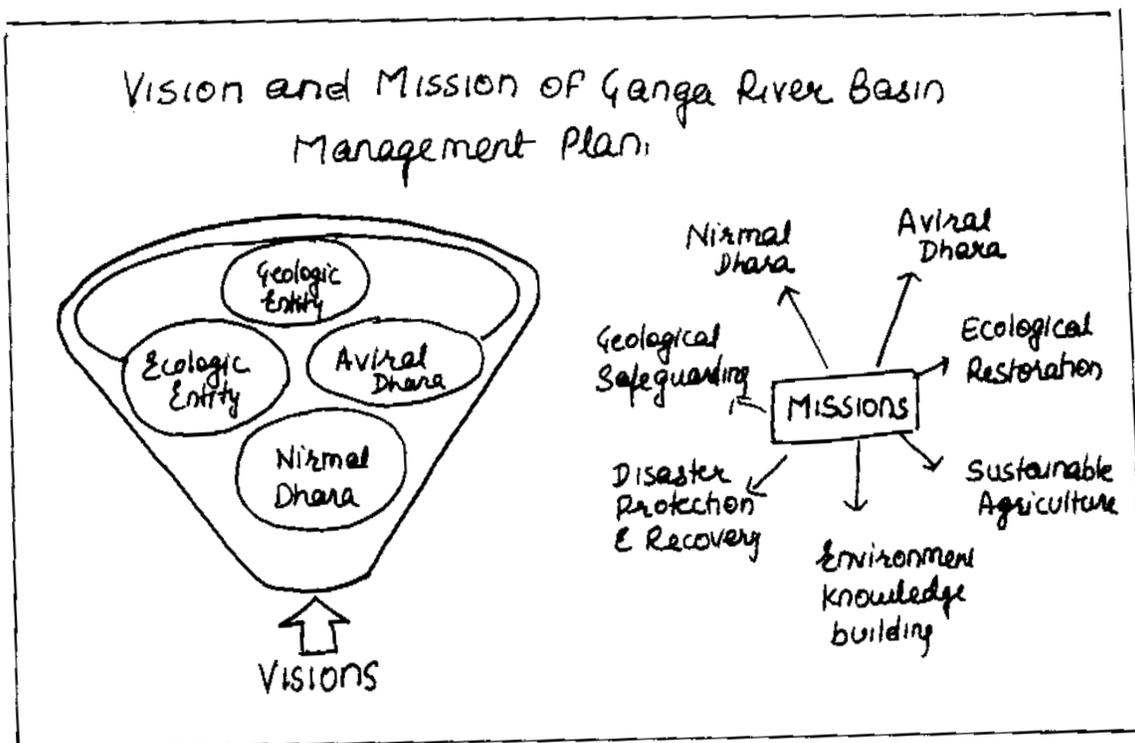
River Surface Cleaning :- River Surface cleaning for collection of floating solid waste from the surface of the Ghats and River and its disposal are afoot and pushed into service at 11 locations.

Bio-Diversity Conservation :- Several Bio-Diversity conservation projects are namely: Biodiversity Conservation and Ganga Rejuvenation, Fish and Fishery Conservation in Ganga River, Ganges River

Dolphin Conservation Education Programme has been initiated. 5 Bio-Diversity center's at Dehradun, Narora, Allahabad, Varanasi and Barrackpore has been developed for restoration of identified priority species.

Afforestation :- Forestry interventions for Ganga through Wildlife Institute of India; Central Inland Fisheries Research Institute and Centre for Environment Education has been initiated. Forestry interventions for Ganga has been executed as per the Detailed Project Report prepared by Forest Research Institute, Dehradun for a period of 5 years (2016-2021) at project cost of Rs.2300 Crores. Work has been commenced in 7 districts of Uttarakahnd for medicinal plants.

Public Awareness :- A series of activities such as events, workshops, seminars and conferences and numerous IEC activities were organized to make a strong pitch for public outreach and community participation in the programme. Various awareness activities through rallies, campaigns, exhibitions, shram daan, cleanliness drives, competitions, plantation drives and development and distribution of resource materials were organized and for wider publicity the mass mediums such as TV/Radio, print media advertisements, advertorials, featured articles and advertorials were published. Gange Theme song was released widely and played on digital media to enhance the visibility of the programme.



Industrial Effluent Monitoring :- The number of Grossly Polluting Industries (GPIs) in April, 2019 are 1072. Regulation and enforcement through regular and surprise inspections of GPIs is carried out for compliance verification against stipulated environmental norms. The GPIs are also inspected on annual basis for compliance verification of the pollution norms and process modification, wherever required through third party technical institutes. First round of inspection of GPIs by the third-party technical institutes has been carried out in 2017. Second round of inspection of GPIs has been completed in 2018. Out of 961 GPIs inspected in 2018, 636 are complying, 110 are non-complying and 215 are self-closed. Action has been taken against 110 non-complying GPIs and are issued closure directions under Section 5 of the E(P) Act. Online Continuous Effluent Monitoring Stations (OCEMS) connectivity established to CPCB server in 885 out of 1072 GPIs.

Ganga Gram :- Ministry of Drinking Water and Sanitation (MoDWS) identified 1674 Gram Panchayats situated on the bank of River Ganga in 5 State (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal). Rs. 578 Crores has been released to Ministry of Drinking Water and Sanitation (MoDWS) for construction of toilets in 1674 Gram Panchayats of 5 Ganga Basin States. Out of the targeted 15, 27,105 units, MoDWS has completed construction of 8, 53,397 toilets. Consortium of 7 IITs has been engaged in the preparation of Ganga River basin Plan and 65 villages has been adopted by 13 IITs to develop as model villages. UNDP has been engaged as the executing agency for rural sanitation programme and to develop Jharkhand as a model State at an estimated cost of Rs. 127 Crore.

National Mission for Clean Ganga, endeavors to deploy best available knowledge and resources across the world for Ganga rejuvenation. Clean Ganga has been a perennial attraction for many international countries that have expertise in river rejuvenation. Countries such as Australia, United Kingdom, Germany, Finland, Israel etc. have shown interest in collaborating with India for Ganga rejuvenation. Memorandums of Understanding (MoUs) were signed with various Central Ministries viz.- Ministry of Human Resource Development, Ministry of Rural Development, Ministry of Railways, Ministry of Shipping, Ministry of Tourism, Ministry of Ayush, Ministry of Petroleum, Ministry of Youth Affairs and Sports, Ministry of Drinking Water & Sanitation and Ministry of Agriculture for synergizing the Government schemes.

National Air Quality Monitoring Programme (NAMP) : Central Pollution Control Board is executing a nation-wide National Air Quality Monitoring Programme (NAMP). The NAMP was started in 1984 with 7 stations in Agra and Anpara. As on 31st March 2015, the ambient air quality monitoring network has 591 operating stations covering 248 cities/towns in 28 States and 5 Union Territories.

- Parameters monitored under NAMP Under NAMP three criteria pollutants viz.
- PM10 (Particulate Matter having aerodynamic diameter less than or equal to 10 μm),
- Sulphur dioxide (SO_2) and
- Nitrogen dioxide (NO_2) were identified for regular monitoring at all locations.

Other notified parameters like Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), $\text{PM}_{2.5}$ (Particulate Matter having aerodynamic diameter less than or equal to 2.5 μm), Benzo(a) pyrene {B(a)P}, Lead (Pb) and Nickel (Ni) are being monitored at selected locations.

The monitoring of meteorological parameters such as wind speed, wind direction, relative humidity and temperature has been also integrated with the monitoring of air quality. The monitoring under the NAMP is being carried out by Central Pollution Control Board with support from State Pollution Control Boards; Pollution Control Committees and National Environmental Engineering Research Institute (NEERI), Nagpur. CPCB co-ordinates with these agencies to ensure uniformity and consistency of air quality data besides providing technical and financial support for operating the monitoring station. Status of Ambient Air Quality in million plus cities during 2013 Increase in industrial activities, population both endemic and floating and vehicular population etc. have led to a rapid increase in environmental problems, one of them being air pollution. An inventory of air pollutants is the first step towards control of air pollution. Air quality categories in cities of India CPCB depicts ambient air quality in terms of low, moderate, high and critical levels by calculating an exceedence factor

The four air quality categories are:

- Critical pollution (C) : when EF is more than 1.5;
- High pollution (H) : when the EF is between 1.0 - 1.5;
- Moderate pollution (M) : when the EF between 0.5 - 1.0; and
- Low pollution (L): when the EF is less than 0.5.

National Mean Concentration of three regularly monitored pollutants

National mean of SO_2 concentration over the years indicates a decline in SO_2 levels. The decreasing trend may be due to various interventions that have taken place in recent years such as reduction in Sulphur level in diesel, use of cleaner fuel such as CNG in metro cities, change in domestic fuel from coal to LPG etc. National mean of NO_2 concentration has remained stable over the years with a slight decrease in last

three years despite increase in sources like vehicles. The reason for this may be various intervention that have taken place such as improvement in vehicle technology and other vehicular pollution control measures like alternate fuel etc. National mean of PM10 concentration shows fluctuating trend exceeding the NAAQS. The reasons being emission from gensets, small scale industries, biomass burning, suspension of traffic dust, natural dust, commercial and domestic use of fuel and vehicular emission etc. Furthermore, the increasing trend of PM10 may be attributed to the increasing number of vehicles and re-suspension of natural dust.

National Ambient Noise Monitoring Network (NANMN) Programme Noise is generated from a variety of indoor and outdoor sources such as industries, transport vehicles, construction activities, generator sets, fire crackers. The Noise Pollution (Regulation and Control) Rules, 2000 were notified by MoEF & CC under the Environment (Protection) Act 1986 and amended in January 2010. Database on noise level is required for policy formulation, setting standards and ensuring compliance of the existing rules. Existing Network: Central Pollution Control Board in association with State Pollution Control Board has established National Ambient Noise Monitoring Network covering 07 metropolitan cities and installed 35 no. of Noise Monitoring System in Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Lucknow and Hyderabad (five stations in each). The Strengthening of the Network has been carried out by adding 35 more stations in the same 07 metropolitan during 2014-15. Thus extending the monitoring network to 70 stations.

Frequency of Monitoring: Ambient Noise Monitoring is carried out in Real Time mode continuously and data captured at central receiving station at CPCB, Delhi is made available on public domain as well as CPCB's website.

ENVIRONMENTAL IMPACT ASSESSMENT

Environment Impact Assessment or EIA can be defined as the study to predict the effect of a proposed activity/project on the environment. A decision making tool, EIA compares various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

What is EIA?

Environment Impact Assessment or EIA can be defined as the study to predict the effect of a proposed activity/project on the environment. A decision making tool, EIA compares various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

EIA systematically examines both beneficial and adverse consequences of the project and ensures that these effects are taken into account during project design. It helps to identify possible environmental effects of the proposed project, proposes measures to mitigate adverse effects and predicts whether there will be significant adverse environmental effects, even after the mitigation is implemented. By considering the environmental effects of the project and their mitigation early in the project planning cycle, environmental assessment has many benefits, such as protection of environment, optimum utilisation of resources and saving of time and cost of the project. Properly conducted EIA also lessens conflicts by promoting community participation, informing decision makers, and helping lay the base for environmentally sound projects. Benefits of integrating EIA have been observed in all stages of a project, from exploration and planning, through construction, operations, decommissioning, and beyond site closure.

Evolution of EIA

EIA is one of the successful policy innovations of the 20th Century for environmental conservation. Thirty-seven years ago, there was no EIA but today, it is a formal process in many countries and is currently practiced in more than 100 countries. EIA as a mandatory regulatory procedure originated in the early 1970s, with the implementation of the National Environment Policy Act (NEPA) 1969 in the US. A large part of the initial development took place in a few high-income countries, like Canada, Australia, and New Zealand (1973-74). However, there were some developing countries as well, which introduced EIA relatively early - Columbia (1974), Philippines (1978).

The EIA process really took off after the mid-1980s. In 1989, the World Bank adopted EIA for major development projects, in which a borrower country had to undertake an EIA under the Bank's supervision

History of EIA in India

The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle. This was subsequently extended to cover those projects, which required the approval of the Public Investment Board. Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support.

On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule 1 of the notification. Since then there have been 12 amendments made in the EIA notification of 1994.

The MoEF recently notified new EIA legislation in September 2006. The notification makes it mandatory for various projects such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbours and airports) and industries including very small electroplating or foundry units to get environment clearance. However, unlike the EIA Notification of 1994, the new legislation has put the onus of clearing projects on the state government depending on the size/capacity of the project.

Certain activities permissible under the Coastal Regulation Zone Act, 1991 also require similar clearance. Additionally, donor agencies operating in India like the World Bank and the ADB have a different set of requirements for giving environmental clearance to projects that are funded by them.

The EIA process

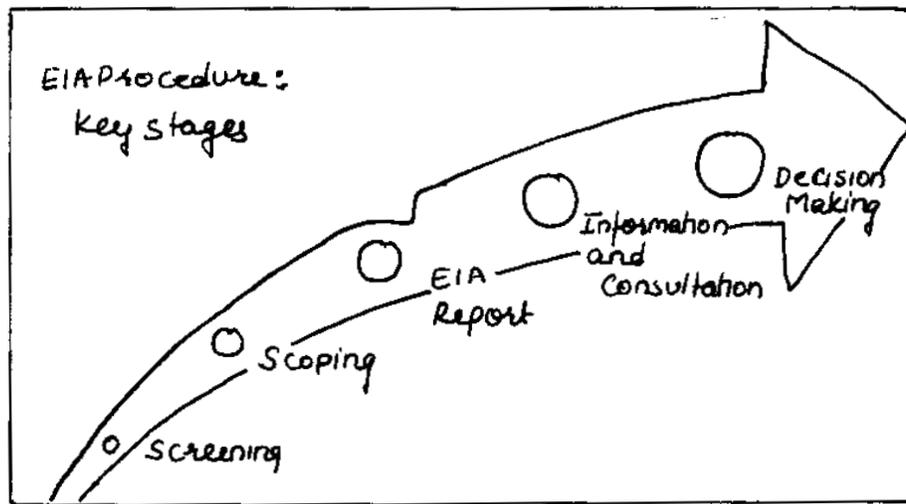
The stages of an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a common structure and the application of the main stages is a basic standard of good practice.

The environment impact assessment consists of eight steps with each step equally important in determining the overall performance of the project. Typically, the EIA process begins with screening to ensure time and resources are directed at the proposals that matter environmentally and ends with some form of follow up on the implementation of the decisions and actions taken as a result of an EIA report. The eight steps of the EIA process are presented in brief below:

- **Screening** : First stage of EIA, which determines whether the proposed project, requires an EIA and if it does, then the level of assessment required.
- **Scoping** : This stage identifies the key issues and impacts that should be further investigated. This stage also defines the boundary and time limit of the study.
- **Impact analysis** : This stage of EIA identifies and predicts the likely environmental and social impact of the proposed project and evaluates the significance.
- **Mitigation** : This step in EIA recommends the actions to reduce and avoid the potential adverse environmental consequences of development activities.
- **Reporting** : This stage presents the result of EIA in a form of a report to the decision-making body and other interested parties.
- **Review of EIA** : It examines the adequacy and effectiveness of the EIA report and provides the information necessary for decision-making.

- **Decision-making** : It decides whether the project is rejected, approved or needs further change.
- **Post monitoring** : This stage comes into play once the project is commissioned. It checks to ensure that the impacts of the project do not exceed the legal standards and implementation of the mitigation measures are in the manner as described in the EIA report.

The overview of the EIA process is represented in figure



Forms of impact assessment

There are various forms of impact assessment such as Health Impact Assessment (HIA) and Social Impact Assessment (SIA) that are used to assess the health and social consequences of development so that they are taken into consideration along with the environmental assessment. One of the forms of impact assessment is strategic environment assessment, which is briefly discussed below:

Strategic environment assessment

Strategic Environment Assessment (SEA) refers to systematic analysis of the environmental effects of development policies, plans, programmes and other proposed strategic actions. This process extends the aims and principles of EIA upstream in the decision-making process, beyond the project level and when major alternatives are still open. SEA represents a proactive approach to integrating environmental considerations into the higher levels of decision-making.

Despite its wide use and acceptance, EIA has certain shortcomings as a tool for minimising environmental effects of development proposals. It takes place relatively late at the downstream end of the decision making process, after major alternatives and directions have been chosen (see table 3: Difference in EIA and SEA).

Difference in EIA and SEA

Environment impact assessment	Strategic environment assessment
<ul style="list-style-type: none"> • Takes place at end of decision-making cycle • Reactive approach to development proposal • Identifies specific impacts on the environment • Considers limited number of feasible alternatives • Limited review of cumulative effects • Emphasis on mitigating and minimizing impacts • Narrow perspective, high level of detail • Well-defined process, clear beginning and end • Focuses on standard agenda, treats symptoms of environmental deterioration 	<ul style="list-style-type: none"> • Takes place at earlier stages of decision making cycle • Pro-active approach to development proposals • Also identifies environmental implications, issues of sustainable development • Considers broad range of potential alternatives • Early warning of cumulative effects • Emphasis on meeting environmental objectives, maintaining natural systems • Broad perspective, lower level of detail to provide a vision and overall framework • Multi-stage process, overlapping components, policy level is continuing, iterative • Focuses on sustainability agenda, gets at sources of environmental deterioration

SEA had limited development and implementation till 1990. However, after 1990, a number of countries in developed economies adopted SEA. Some countries such as Canada and Denmark have made provision for SEA of policy, plans and programmes separately from EIA legislation and procedure. Other countries such as Czech Republic, Slovakia, etc have introduced SEA requirements through reforms in EIA legislation and in case of United Kingdom through environmental appraisal. While in New Zealand and Australia, it is a part of resource management or biodiversity conservation regimes. The adoption of SEA is likely to grow significantly in the coming years especially with directives by European Union and Protocol to the UNECE Convention on Trans boundary EIA by signatory countries

Strategic Environmental Assessment (SEA) is the process of predicting and evaluating the impact of a strategic action on the environment, and using that information in decision-making. SEA is basically environmental impact assessment of strategic actions: policies, plans and program. Environmental impact assessment of projects is the starting point for SEA, but EIA and SEA have some key differences:

Strategic Environmental Assessment of Policies, Plans and Program

- Takes place at earlier stages of decision-making cycle: aims to prevent impacts
- Pro-active approach to development proposals
- Considers broad range of potential alternatives
- Cumulative effects assessment is key to SEA
- Emphasis on meeting environmental objectives, maintaining natural systems
- Broad perspective, lower level of detail to provide a vision and overall framework
- Multi-stage process, overlapping components, policy level is continuing, iterative
- Focuses on sustainability agenda, gets at sources of environmental deterioration

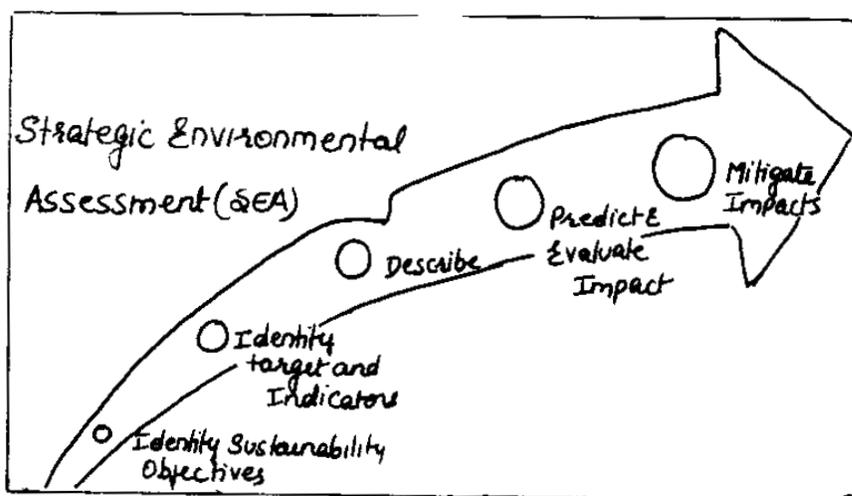
whereas EIA of Projects

- Takes place near the end of decision-making cycle: aims to minimize impacts
- Reactive approach to development proposal
- Considers limited number of feasible alternatives
- Limited review of cumulative effects
- Emphasis on mitigating and minimizing impacts
- Narrow perspective, high level of detail
- Well-defined process, clear beginning and end
- Focuses on standard agenda, treats systems of environmental deterioration

Limitations of EIA

- EIA takes place once many strategic decisions have already been made, it can often address only a limited range of alternatives and mitigation measures: those of a wider nature are generally poorly integrated into project planning.
- Consultation in EIA is also limited and the contribution of EIA to the eventual decision regarding the project is unclear.

- Although project EIA is widely used and accepted as a useful tool in decision-making, it largely reacts to development proposals rather than proactively anticipating them
- Project EIAs are also generally limited to the project's direct impacts. This approach ignores a wide range of impacts, including:
 - o Cumulative impacts: the environmental impacts of multiple plans, projects and other actions
 - o global impacts: impacts that go beyond the local, project level, for instance climate change
 - o indirect, secondary or induced impacts: impacts that occur several steps away from the original action, for instance new houses that generate more vehicle movements that increase air pollution that affect the flora in an area
 - o Synergistic impacts: where impact A + impact B have a total impact of more than A+B: for instance NO_x emissions and ozone emissions which together cause smog, which has impacts over and above those of just the NO_x + ozone



Strategic Environmental Assessment can deal with many of these difficulties, as it:

1. incorporates environmental issues into project planning and decision making;
2. considers alternatives or mitigation measures beyond project level
3. involves consultation on more strategic issues

Promotion of sustainable development

- SEA is that it can enhance the integration of environmental concerns in policy and planning processes, thereby helping to implement sustainable development.

- It can help to ensure that environmental and sustainability criteria are fully considered throughout the planning process, for instance in the identification of suitable (or unsuitable) locations for development, and in the assessment of alternative strategic actions.
- Identify Sustainability Objectives – Ensures that issues of ESD are incorporated at the earliest stage of decision making in the process
- Identify Targets and Indicators – Determines whether the objectives of the strategic action are achieved
- Describe Environmental Baseline – Illustrates the existing environmental/sustainability conditions in the context of the strategic action
- Predict and Evaluate Impacts – Determines the sustainability impacts of the strategic action alternatives and identifies opportunities for mitigation
- Mitigate Impacts – An ongoing process to ensure the strategic action is sustainable and the impacts of the proposed strategic action are minimized
- Write SEA Report – Documents the strategic action, and the Strategic Environmental Assessment process, results and decision making
- Establish Environmental Guidelines
- Monitor Environmental Impacts

Environment Impact Assessment Notification

- The Environmental Impact Assessment (EIA) has been amended from time to time to address emerging concerns stemming from the need to integrate environmental concerns into the developmental process for achieving the goal of sustainable development.
- While according EC to development projects, necessary conditions, environmental safeguard and measures are stipulated for their effective implementation during the construction and operation of the project.
- The safeguard measures intended to minimize adverse impacts, inter alia, on (i) air quality, (ii) water quality, (iii) land degradation, (iv) biodiversity, and (v) wildlife habitat.
- In addition, rainwater harvesting, water conservation, greenbelt and plantation, wildlife conservation plan, etc. are also required to be implemented in the project.