

POLLUTION AND ITS MANAGEMENT

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Abstract - Pollution is the introduction of contaminants into the natural environment that cause adverse effect. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants are the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often called as point source or nonpoint source pollution. A pollutant is a waste material that pollutes air, water or soil. Three factors determine the severity of a pollutant: its chemical nature, the concentration and the persistence and controlling those materials in constructive way. The burning of coal and wood, and the presence of many horses in concentrated areas made the cities the cesspools of pollution. The Industrial Revolution brought an infusion of untreated chemicals and wastes into local streams that served as the water supply. Those days King Edward I of England banned the burning of sea-coal by proclamation in London in 1272, when its smoke became a problem. Thus Air pollution has always accompanied civilizations.

Ancient cultures: Pollution started from prehistoric times when man created the first fire. According to a 1983 article in the journal Science, "soot" found on ceilings of prehistoric caves provides ample evidence of the high levels of pollution that was associated with inadequate ventilation of open fires." Metal forging appears to be a key turning point in the creation of significant air pollution levels outside the home. Core samples of glaciers in Greenland indicate increases in pollution associated with Greek, Roman and Chinese metal production, but at that time the pollution was comparatively small and could be handled by nature. The burning of coal and wood, and the presence of many horses in concentrated areas made the cities the cesspools of pollution. The Industrial Revolution brought an infusion of untreated chemicals and wastes into local streams that served as the water supply.

Urban pollution: It was the industrial revolution that gave birth to environmental pollution as we know it today. London also recorded one of the earlier extreme cases of water quality problems with the Great Stink on the Thames of 1858, which led to construction of the London sewerage system afterward. Pollution issues escalated as population growth far exceeded view ability of neighborhoods to handle their waste problem. Reformers began to demand sewer systems, and clean water. In 1870, the sanitary conditions in Berlin were among the worst in Europe. August Bebel recalled conditions, before a modern sewer system was built in the late 1870s: "Waste-water from the houses collected in the gutters running alongside the curbs and emitted a truly fearsome smell. There were no public toilets in the streets or squares.

Visitors, especially women, often became desperate when nature called. In the public buildings the sanitary facilities were unbelievably primitive....As a metropolis; Berlin did not emerge from a state of barbarism into civilization until after 1870."The

primitive conditions were intolerable for a world national capital, and the Imperial German government brought in its scientists, engineers and urban planners to not only solve the deficiencies but to forge Berlin as the world's model city. A British expert in 1906 concluded that Berlin represented "the most complete application of science, order and method of public life," adding "it is a marvel of civic administration, the most modern and most perfectly organized city.



Fig.1

The emergence of great factories and consumption of immense quantities of coal gave rise to unprecedented air pollution and the large volume of industrial chemical discharges added to the growing load of untreated human waste. Chicago and Cincinnati were the first two American cities to enact laws ensuring cleaner air in 1881. Pollution became a

major issue in the United States in the early twentieth century, as progressive reformers took issue with air pollution caused by coal burning, water pollution caused by bad sanitation, and street pollution caused by the 3 million horses who worked in American cities in 1900, generating large quantities of urine and manure. The generation of 1940 first saw automobiles replacing the horses saw cars as "miracles of cleanliness. However, automobile-caused smog was a major issue in Los Angeles.

Awareness of atmospheric pollution spread widely after World War II, with fears triggered by reports of radioactive fallout from atomic warfare and testing. Then a non-nuclear event, The Great Smog of 1952 in London, killed at least 4000 people. This prompted some of the first major modern environmental legislation, The Clean Air Act of 1956.

Pollution began to draw major public attention in the United States between the mid-1950s and early 1970s, when Congress passed the Noise Control Act, the Clean Air Act, the Clean Water Act and the National Environmental Policy Act. The development of nuclear science introduced radioactive contamination, which can remain lethally radioactive for hundreds of thousands of years. Lake Karachay, named by the Worldwatch Institute as the "most polluted spot" on earth, served as a disposal site for the Soviet Union throughout the 1950s and 1960s. Second place may go to [weasel words] the area of Chelyabinsk, Russia, as the "Most polluted place on the planet".

Nuclear weapons continued to be tested in the Cold War, especially in the earlier stages of their development. The toll on the worst-affected populations and the growth since then in understanding about the critical threat to human health posed by radioactivity has also been a prohibitive complication associated with nuclear power. Though extreme care is practiced in that industry, the potential for disaster suggested by incidents such as those at Three Mile Island and Chernobyl pose a lingering spectre of public mistrust. Worldwide publicity has been intense on those disasters. Widespread support for test ban treaties has ended almost all nuclear testing in the atmosphere.

International catastrophes such as the wreck of the Amoco Cadiz oil tanker off the coast of Brittany in 1978 and the Bhopal disaster in 1984 have demonstrated the universality of such events and the scale on which efforts to address them needed to engage. The borderless nature of atmosphere and oceans inevitably resulted in the implication of pollution on a planetary level with the issue of global warming.

A much more recently discovered problem is the Great Pacific Garbage Patch, a huge concentration of plastics, chemical sludge and other debris which has been collected into a large area of the Pacific Ocean by the North Pacific Gyre. This is a less well known pollution problem than the others described above,

but nonetheless has multiple and serious consequences such as increasing wildlife mortality, the spread of invasive species and human ingestion of toxic chemicals. Organizations have done research on the pollution, along with artists like Marina DeBris, are working. Pollution introduced by light at night is becoming a global problem, more severe in urban centres, but nonetheless contaminating also large territories, far away from towns.

THE MAJOR FORMS OF POLLUTION

Air pollution: the release of chemicals and particulates into the atmosphere. Common gaseous pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. Particulate matter, or fine dust is characterized by their micrometer size PM10 to PM2.5.

Noise pollution: which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.

Light pollution: includes light trespass, over-illumination and astronomical interference.

Thermal pollution, is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant. Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash, municipal solid waste or space debris.



Fig.2

Water pollution, by the discharge of wastewater from commercial and industrial waste (intentionally or through spills) into surface waters; discharges of untreated domestic sewage, and chemical contaminants, such as chlorine, from treated sewage;

release of waste and contaminants into surface runoff flowing to surface waters (including urban runoff and agricultural runoff, which may contain chemical fertilizers and pesticides).

Plastic pollution: involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans.

Littering is the criminal throwing of inappropriate man-made objects, onto public and private properties.

Soil pollution or contamination occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, MTBE, herbicides, pesticides and chlorinated hydrocarbons. Some of the more common soil contaminants are chlorinated hydrocarbons (CFH), heavy metals (such as chromium, cadmium—found in rechargeable batteries, and lead—found in lead paint, aviation fuel and still in some countries, gasoline), MTBE, zinc, arsenic and benzene. In 2001 a series of press reports culminating in a book called *Fateful Harvest* unveiled a widespread practice of recycling industrial byproducts into fertilizer, resulting in the contamination of the soil with various metals. Ordinary municipal landfills are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of polychlorinated dibenzodioxins, commonly called dioxins for simplicity, such as TCDD. The main sources of soil pollution is, improperly disposed human and animal excreta, solid and liquid wastes. The deforestation causes soil erosion ;due to which upper fertile layer gets removed.

Radioactive pollution: or contamination, resulting from 20th century activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment. Radioactive radiations are highly penetrating in nature with sufficient energy to damage living organism, bringing disorder in body ; it not only causes pathological damage but also genetic disorder. The radiation affects chromosomes and causes mutations ,which passes from one generation to next, leading to cancer and leukaemia..Hence safe handling and disposal should be adapted. .

Cost of pollution

Pollution has cost. Manufacturing activities that cause air pollution impose health and clean-up costs on the whole society, whereas the neighbors of an individual who chooses to fire-proof his home may benefit from a reduced risk of a fire spreading to their own houses. If external costs exist, such as pollution, the producer may choose to produce more of the product than would be produced if the producer were required to

pay all associated environmental costs. Because responsibility or consequence for self-directed action lies partly outside the self, an element of externalization is involved. If there are external benefits, such as in public safety, less of the good may be produced than would be the case if the producer were to receive payment for the external

SOURCES AND CAUSES:

Air pollution produced by ships may alter clouds, affecting global temperatures.

Air pollution comes from both natural and human-made (anthropogenic) sources. However, globally human-made pollutants from combustion, construction, mining, agriculture and warfare are increasingly significant in the air pollution equation.

Motor vehicle emissions are one of the leading causes of air pollution. China, United States, Russia, India, Mexico, and Japan are the world leaders in air pollution emissions. Principal stationary pollution sources include chemical plants, coal-fired power plants, oil refineries, petrochemical plants, nuclear waste disposal activity, incinerators, large livestock farms (dairy cows, pigs, poultry, etc.), PVC factories, metals production factories, plastics factories, and other heavy industry. Agricultural air pollution comes from contemporary practices which include clear felling and burning of natural vegetation as well as spraying of pesticides and herbicides. About 400 million metric tons of hazardous wastes are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the world's population, but produce roughly 25% of the world's CO₂, and generate approximately 30% of world's waste. In 2007, China has overtaken the United States as the world's biggest producer of CO₂, [33] while still far behind based on per capita pollution - ranked 78th among the The major forms of pollution are listed below along with the particular contaminant relevant to each of them.



Fig.3 Air pollution

Pollution can also be the consequence of a natural disaster. For example, hurricanes often involve water contamination from sewage, and petrochemical spills from ruptured boats or automobiles. Larger scale and environmental damage is not uncommon when coastal oil rigs or refineries are involved. Some sources of pollution, such as nuclear power plants or oil tankers, can produce widespread and potentially hazardous releases when accidents occur. See Fig.4

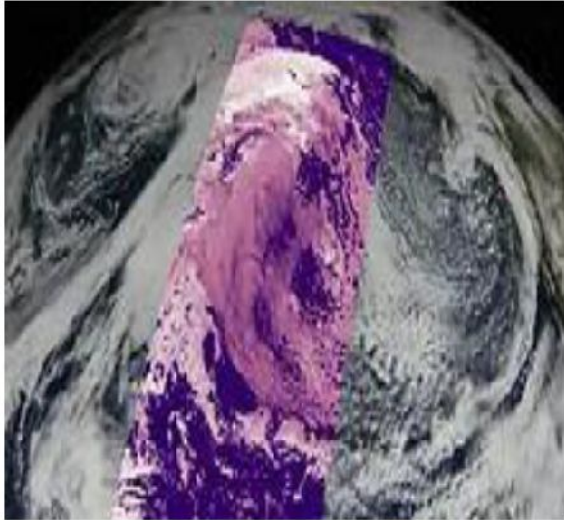


Fig.4

In the case of noise pollution the dominant source class is the motor vehicle, producing about ninety percent of all unwanted noise worldwide.

Effect on Human health Further information: Soil pollution § Health effects, Toxic hotspots, and List of pollution-related diseases

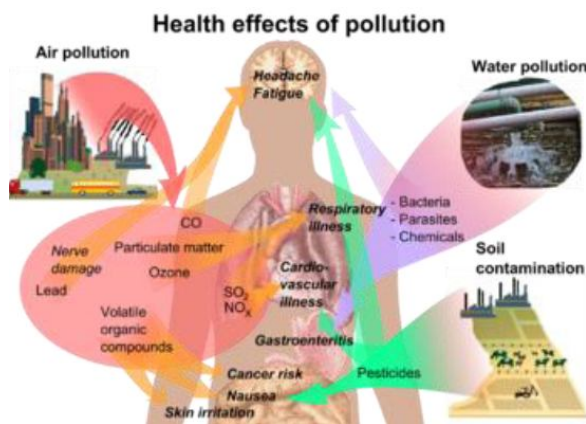


Fig.5

Overview of main health effects on humans from some common types of pollution

Adverse air quality can kill many organisms including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per

day, mostly due to contamination of drinking water by untreated sewage in developing countries. An estimated 500 million Indians have no access to a proper toilet ,Over ten million people in India fell ill with waterborne illnesses in 2013, and Nearly 1,535 people died, most of them children. Nearly 500 million Chinese lack access to safe drinking water. A 2010 analysis estimated that 1.2 million people died prematurely each year in China because of air pollution. The WHO estimated in 2007 that air pollution causes half a million deaths per year in India.[45] Studies have estimated that the number of people killed annually in the United States could be over 50,000.

Oil spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to developmental deficits in children and neurologic symptoms. Older people are majorly exposed to diseases induced by air pollution. Those with heart or lung disorders are at additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems. Chemical and radioactive substances can cause cancer and as well as birth defects.

Effect on Environment: Pollution has been found to be present widely in the environment. There are a number of effects of this:

Biomagnification describes situations where toxins (such as heavy metals) may pass through trophic levels, becoming exponentially more concentrated in the process.

Carbon dioxide emissions cause ocean acidification, the on-going decrease in the pH of the Earth's oceans as CO₂ gets dissolved.

The emission of greenhouse gases leads to global warming which affects ecosystems in many ways.

Nitrogen oxides are removed from the air by rain and fertilise land which can change the species composition of ecosystems.

Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and leads to the production of tropospheric ozone which damages plants.

Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web.

Sulphur dioxide and nitrogen oxides can cause acid rain which lowers the pH value of soil.

Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from overconsumption,

heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control. In the field of land development, low impact development is a similar technique for the prevention of urban runoff

Practices

- Recycling
- Reusing
- Waste minimisation
- Mitigating
- Preventing
- Compost

Pollution control devices

- Air pollution control
- Thermal oxidizer
- Dust collection systems
- Baghouses
- Cyclones
- Electrostatic precipitators
- Scrubbers
- Baffle spray scrubber
- Cyclonic spray scrubber
- Ejector venturi scrubber
- Mechanically aided scrubber
- Spray tower
- Wet scrubber
- Sewage treatment
- Sedimentation (Primary treatment)
- Activated sludge biotreaters
- Aerated lagoons
- Constructed wetlands (also used for urban runoff)
- Industrial wastewater treatment
- API oil-water separators
- Biofilters
- Dissolved air flotation (DAF)
- Powdered activated carbon treatment
- Ultrafiltration
- Vapor recovery systems



Fig.6 A litter trap catches floating waste in the Yarra River, east-central Victoria, Australia



Fig.7 Air pollution control system, known as a Thermal oxidizer, decomposes hazard gases from industrial air streams at a factory in the United States of America



Fig.8 A dust collector in Pristina, Kosovo



Fig.9 Gas nozzle with vapour recovery



Fig.10 A Mobile Pollution Check Vehicle in India.

Conclusion: Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from overconsumption, heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control. In the field of

land development, low impact development is a similar technique for the prevention of urban runoff. Growing evidence of local and global pollution and an increasingly informed public over time have given rise to environmentalism and the environmental movement, which generally created awareness to limit human impact on the environment.

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