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CRITICAL REVIEW OF ENVIRONMENTAL POLLUTION IN INDIA

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Abstract :

As factories and business enterprises grew in large numbers in a given location, this led to the rise and growth of cities as people moved from the rural areas into urban areas in search of jobs. The Industrial Revolution created an industrial society where the living conditions were much better than that of living in the rural society. There was an increase in the availability of food, clothing and shelter, health care, educational opportunities and better wages. The mass production of productions caused prices to drop, making products once only available to the rich to be now affordable to the poor. Thus, living in the cities provided both political and economic freedom.

Keywords: Critical Review , Environmental Pollution , Business Enterprises , Industrial Revolution.

INTRODUCTION

However, in spite of the technological and socioeconomic advancement during this era through mechanization of agriculture, factories and transportation system, it was during this Industrial Revolution of urbanization, and industrialization that also gave rise to dreadful sanitary and public health conditions in which people had to live and work. The explosion in urban growth created unforeseen sanitary and public health problems that was as a result of overcrowded cites by large number of people moving from the rural areas. This dense population of people living in cities cause the widespread of diseases such as Tuberculosis (TB) and Cholera thus, creating epidemics especially among the poorer class.

As the number of factories grew with the thousands of people coming in from the rural areas seeking better paying jobs, shelters and rooms became overcrowded where a room would be rented to whole family. Houses were overcrowded and If there were no rooms to be rented, then people would bunch up in lodging houses. Workplaces were overcrowded and in bad sanitary conditions (women and young children were also employed and were working in these conditions) where there were no proper running water to bathe regularly. The cities didn't have a proper planned sewage and garbage collecting system. The cities were also covered by layer of dirty black smoke (from burning coal that was used to heat water so as to create steam to run the machines) often covered the streets. The factories chimneys would continually belched out these dark, dirty and poisonous smoke into the atmosphere, polluting it. This blocked out most of the Sun's light giving the city a bleak and gloomy look. Due to this rapid urbanization that led to overcrowd cities it caused a health crisis. Water pollution carried water borne disease, Cholera manifested and spread over the population killing thousands. No one knew exactly what caused this disease until about 1855 when John Snow, a London physician, traced a part of the cholera epidemic to a contaminated water pump on Broad Street.

INDUSTRIAL REVOLUTION AND PUBLIC HEALTH

The Industrial Revolution was a time of dramatic social, economical and technological changes. It was a period that was defined by a major and rapid transition from an agricultural and commercial society (an economy based on manual labor) to a modern industrial society dominated by new technology powered machines (an economy based on complex machinery). The Industrial Revolution era began in the late 18th and early 19th century first, it started in Britain then spread to other nations. It was an revolutionary change in the sense that it led to an entirely new method of how work was done. There were now; several factories with complex machines manufacturing all kinds of products under what is called mass production; large industrial cities with new jobs that caused people to move in large numbers looking for employment; the transportation system was revolutionized through use of steam-powered machines (fueled by coal) giving rise to trains, steam ships and also the invention of cars. Also, family needs was no longer based on production but rather on unity of consumption.

Broadwick found that by removing the pump, it dramatically reduced the spread (and incidences) of Cholera in the area. This provided additional proof at the time that there was a relationship between a water pump (contaminated water) and the victims of the disease. This added weight to the debate that Government had to be involved in maintaining health of the population. Louis Pasteur in 1864, also proved that germs exist and published in 1878 that most infectious diseases are caused by germs, known as the "germ theory of disease". This further supported the importance of why water has to be kept clean at all times.

In spite of the health crisis, many positive effects on the lives of the British and other nation aroused to the betterment of the population. As concerns grew about the health crisis, reformers began the slow process of remedying the social health problems where public and factory reforms were made. The Public Health Act of 1848 was passed based on the outcome of Chadwick's Sanitary report. The government introduced improvements in sanitary and social conditions to control and remedy the situation such as: proper sewer, install gas lighting, regular garbage collection, created parks, install and build houses and factories with proper drains and water supplies.

Public health services created by the government were financed by taxation, with no charge to the user of such services. There was an increase in public health department and government hired public health inspectors to reinforce these laws. Through the public health many premature death from epidemics diseases such as cholera, plague and many other infectious diseases were prevented. Life expectancy was now greatly improved and this enhanced the quality of life. Public health services were provided by a team of specialists trained in sanitary engineering, environmental, medicine, nursing, social and behavioral sciences, administration, health education, just to name a few. This legacy is passed on to this present day generation to promote and preserve good health therefore protecting society from the clutches of epidemic diseases thus, improving our quality of life.

INDUSTRIAL POLLUTION:

Industrial pollution is pollution which can be directly linked with industry, in contrast to other pollution sources. This form of pollution is one of the leading causes of pollution worldwide; in the United States, for example,

the Environmental Protective Agency estimates that up to 50% of the nation's pollution is caused by industry. Because of its size and scope, industrial pollution is a serious problem for the entire planet, especially in nations which are rapidly industrializing, like China.

This form of pollution dates back to antiquity, but widespread industrial pollution accelerated rapidly in the 1800s, with the start of the Industrial Revolution. The Industrial Revolution mechanized means of production, allowing for a much greater volume of production, and generating a corresponding increase in pollution. The problem was compounded by the use of fuels like coal, which is notoriously unclean, and a poor understanding of the causes and consequences of pollution.

There are a number of forms of industrial pollution. One of the most common is water pollution, caused by dumping of industrial waste into waterways, or improper containment of waste, which causes leakage into groundwater and waterways. Industrial pollution can also impact air quality, and it can enter the soil, causing widespread environmental problems.

Because of the nature of the global environment, industrial pollution is never limited to industrial nations. Samples of ice cores from Antarctica and the Arctic both show high levels of industrial pollutants, illustrating the immense distances which pollutants can travel, and traces of industrial pollutants have been identified in isolated human, animal, and plant populations as well.

Industrial pollution hurts the environment in a range of ways, and it has a negative impact on human lives and health. Pollutants can kill animals and plants, imbalance ecosystems, degrade air quality radically, damage buildings, and generally degrade quality of life. Factory workers in areas with uncontrolled industrial pollution are especially vulnerable.

A growing awareness of factory pollution and its consequences has led to tighter restrictions on pollution all over the world, with nations recognizing that they have an obligation to protect themselves and their neighbors from pollution. However, industrial pollution also highlights a growing issue: the desire of developing nations to achieve first world standards of living and production. Those countries that are already industrialized want to keep their place in the World Economy, and those that aren't want a better position in the world economy egg China. As these countries industrialize, they add to the global burden of industrial pollution, triggering serious discussions and arguments about environmental responsibility and a desire to reach a global agreement on pollution issues.

Industrial pollution is unwanted liquid or solid wastes dumped [intentionally or unintentionally] in the environment.

E) THE EFFECT OF INDUSTRIAL POLLUTION ON ENVIRONMENT

Pollutants given off by various industries and factories are often considered to be one of the prime factors contributing to air, water and soil pollution. According to the Environmental Protection Agency (EPA), it has been estimated that industrial pollution is responsible for almost 50 percent of the pollution present in the United States. There are various wide-ranging effects, as well as serious consequences, of industrial pollution on the ecological balance of the atmosphere.

GLOBAL WARMING

Global warming is one of the most common and serious consequences of industrial pollution. The emission of various greenhouse gases such as CO2, methane (CH4), among others from various industries, increases the overall temperature of the earth, resulting in global warming. Global warming has various serious hazards, both on the environment as well as on human health. It results in melting of glaciers and snow-capped mountains, causing an increase of the water levels in seas and rivers, thereby increasing the chances of flood. Apart from this, global warming also has numerous health risks on humans, such as increase of diseases such as malaria and dengue, cholera, Lyme disease and plague, among others.

AIR POLLUTION

Industrial pollution, as stated above, is one of the major causes of air pollution. With the increase in the number of industries and factories due to the industrial revolution; air pollution also has increased significantly. The emissions from various industries contain large amounts of gases such as carbon dioxide, sulphur and nitrogen, among others. These gases, when present in elevated levels in the atmosphere, often result in various environmental and health hazards such as acid rain, and various skin disorders in individuals.

WATER POLLUTION

Pollution emitted from the industries is also one of the major factors contributing towards water pollution. Dumping of various industrial waste products into water sources, and improper contamination of industrial wastes,

often result in polluting the water. Such water pollution disturbs the balance of the ecosystem inside, resulting in the death of various animal and plant species present in the water.

SOIL POLLUTION

Soil pollution is defined as a phenomenon is which the soil loses its structure and fertility due to various natural and artificial reasons. Dumping of industrial wastes is one of the prime factors contributing towards soil pollution. Industrial wastes contain large amounts of various chemicals which get accumulated on the top layer of the soil, resulting in loss of fertility of the soil. Such loss of fertility ultimately results in changes in the ecological balances of the environment due to reduction in plant growth.

OTHER COMMON EFFECTS

Certain other common effects of industrial pollution include damaging buildings and structures, increasing the risk of various occupational hazards such as asbestosis, pneumoconiasis, among others.

ENVIRONMENTAL POISONING:

It deals with potentially harmful impact of chemicals present as pollutants of the environment, to living organisms. Environment includes all the surroundings of living organisms, especially the air, soil and water. A pollutant is a substance present in the environment due to human activity, and which has a harmful effect on living organisms. More than 60,000 chemicals are said to be in common use. With advances in technology, pollution is increasing. The main causes of pollution are the production and use of industrial chemicals, increased use of insecticides, etc., in agriculture and production and use of energy. Threshold limit values (TLV) for about 600 chemicals commonly used have been prepared in USA.

MAJOR ENVIROJNEMTENT AND PUBLIC HEALTH ISSUES

Greenhouse gas (GHG) emissions from the oil sands (Section 6) are major environment issue, Although substantial progress has been made in reducing the quantity of GHG emitted per unit of production (emissions intensity) by the oil sands, and future reductions in emissions intensity will occur. The rapid pace of growth in bitumen production means direct oil sands GHG emissions have grown substantially with current and projected development; direct GHG emission will continue to grow at a time when Canada has accepted targets for substantial overall reductions in response to the Copenhagen Accord. Technological solutions, such as carbon capture and storage (CCS), will not be sufficient to eliminate projected GHG emission increases from oil sands operations over the next decade.

The impact of non-GHG emission on air quality (Section 7) is an important issue for oil sands development because there operations are major emitters of air pollutant issue for oil sands development because these operations re major emitters of air pollutants on local regional and national scales Extensive regional air quality monitoring has confirmed recent problems with odorous emissions which must be resolved other regional ambient air quality issues are not evident but concerns over acid-forming emission (SO2 NOx) and polycyclic aromatic hydrocarbons (PAH) will need to be dealt with. There has been a policy of Alberta Environment (AENV) to require the best available technology economically achievable (BATEA) for emission controls AENV must demonstrate consistent adoption of BATEA as its policy has long stated .In a national context the oil sands industry in total is not the largest emitter in.

GLOBAL WARMING'S IMPACT ON HUMAN HEALTH

The accumulation of greenhouse gases in the atmosphere is making itself felt on earth in the form of increases in global average land ocean surface temperatures, increases in show melt and receding glaciers. Thawing of permafrost. Increases in the mean sea level. And change in precipitation, 15 these effects crate conditions that threaten human health directly and indirectly.

The high temperatures associated with global warming have direct implications for human health. Historically, global average temperatures have been quite stable. However, since 1909 the average temperature has risen 0.74 c (1.33f) 16. in the U.S the number of heat waves in the eastern and western regions rose by about 20%.

COAL'S ASSAULT ON HUMAN HEALTH

Between 1949 and 1995 17 prolonged exposure to high temperature can cause heat cramps, heat syncope, heat exhaustion, and heat stroke, which often leads to death. Advanced age is the most significant risk factor for heat related death in the U.S as the elderly are often less mobile, frequently home bound and socially isolated and may have

thermoregulatory problems associated with multiple co-morbidities and medications that put them at higher risk for death during intense heat waves. 18 in addition, excessive heat exposure disprotionately affect people with certain pre-existing medical conditions, including cardiovascular dieseas, respiratory illnesses, and obesity.

It is difficult to quantify the number of deaths that result from heat waves, as related deaths may be attributed to pre-existing conditions. However it is know that in 2003, between 22,000 and 35,000 people died as a direct result of the heat wave that swept Europe 19.20 while it is impossible to attribute any specific heat wave to global warming more than double the probability of that heat occurring 21.

In addition to the heath effects, global warming caused a problems extreme wealth events and changing patterns of precipitation increase mortality form drowning. Flooding and infrastructure damage, along with temperature rise. Increase the prevalence of insect water borne diseases such as diarrhea, malaria and dengue fever. High temperature and continued fossil fuel consumption worsen air quality inputting respiratory and cardiovascular health. Channing patterns of precipitation, rising temperatures and extreme weather events cause crop damage and crop failure, affecting global food security. Competition for scarce resources such as food and water are predicated to cause mass migrations of environmental refuges, social destabilization, and war, while social destabilization and increasing global health problems are predicated to increase the risk of mental.

Health problems, further adding to the burden on healthcare resources. Many of these health effects are already evident. The world health organization (WHO) has quantified the annual impact of global warming on some health outcomes WHO hs estimated that global warming was responsible for 166,000 deaths in the year 2000 along, due to additional morality from malaria malnutrition, diarrhea, and drowning. In additional, WHO estimated that in 2000 global warming caused increase in diarrhea malaria cardiovascular disease, and malnutrition that led to the loss of more than five million life years to disability from illness premature death 23 shown in figure 6.4

The health burden of global warming already large is predicted to increase. Table ES (see page) shows the predicted health effects of global warming, the mechanisms that would drive these effects and the populations most vulnerable to their implications.

HUMAN HEALTH RISK DUE TO CEMENT DUST EXPOSURE

- Some of the initial studies have shown that the incremental individual risk due to emissions of the cement plant is very low not only with regard to health effects, but also in relation to toxicological and cancer risks produced by pollutants emitted by the cement kiln (see, for example, Schuhmacher et al. 2004), but that conclusion has been challenged. Similarly, earlier conclusion that long-term exposure to cement dust does not lead to higher morbidity of severe respiratory disease than other types of blue collar work (Vestbo and Rasmussen 1990) has also been challenged.

- Studies have shown that adverse respiratory health effects seen in the people exposed to cement dust, exemplified in increased frequency of respiratory symptoms and decreased ventilatory function, observed among cement workers could not be explained by age, BMI and smoking, thus are likely to be caused by exposure to cement dust (Al-Neaimi et al 2001).

- Cement dust contains heavy metals like nickel, cobalt, lead, chromium, pollutants hazardous to the biotic environment, with adverse impact for vegetation, human and animal health and ecosystems (Baby et al. 2008).

- The population most exposed to cement dust pollution includes workers and managers in cement plants and factories, families of workers and managers living in staff houses of factories, and other neighbourhood habitations. Children studying in the schools situated in proximity to factories are particularly prone to cement dust exposure.

- Several studies have demonstrated linkages between cement dust exposure, chronic impairment of lung function and respiratory symptoms in human population. Cement dust irritates the skin, the mucous membrane of the eyes and the respiratory system. Itsdeposition in the respiratory tract causes a basic reaction leading to increased pH values that irritates the exposed mucous membranes (see, Zeleke et al. 2010, and references cited therein).

- Occupational cement dust exposure has been associated with an increased risk of liver abnormalities, pulmonary disorders, and carcinogenesis. Decreased antioxidant capacity and increased plasma lipid peroxidation have been posed as possible causal mechanisms of disease (Aydin et al. 2010).

- Total cement dust exposure has been found to be related to acute respiratory symptoms and acute ventilatory effects. Implementing measures to control dust and providing adequate personal respiratory protective equipment for the production workers are highly recommended (Zeleke et al. 2010).

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- Total cement dust exposure has been found to be related to acute respiratory symptoms and acute ventilatory effects. Implementing measures to control dust and providing adequate personal respiratory protective equipment for the production workers are highly recommended (Zeleke et al. 2010).

- Chronic exposure to Portland cement dust has been reported to lead to a greater prevalence of chronic respiratory

symptoms and a reduction of ventilatory capacity. The seriousness of pulmonary function impairment and respiratory disease has not been consistently associated with the degree of exposure (Al-Neaimi et al 2001).

●Inhalable dust concentrations in cement production plants, especially during cleaning tasks, are usually considerably higher than at the construction site (Peters et al. 2009).

● People of cement dust zone area badly affected by respiratory problems, gastrointestinal diseases etc (Adak et al. 2007).

●The observed acute respiratory health effects among the workers are most likely due to exposure to high concentrations of irritant cement dust. The results also highlight the usefulness of the questionnaire for health surveillance of the acute respiratory health effect (Mwaiselage et al. 2006).

●Diseases such as chest pain, cough, and eye problems in the villages affected by cement dust are likely to be derived due to cement dust. Indeed, the higher percentage of related diseases occurs near the source of pollutant. A relative risk ratio assessment indicates that the exposed subjects are 7.5 and 22.5 times as likely to develop the disease during the follow-up period compared to the unexposed subjects (Yhdego 1992).

●A study to evaluate the mutagenic effects of occupational exposure to cement dust in such workers concludes that the chromosomal damage was more pronounced in the workers who are also smokers when compared with the non-smokers both in control and exposed groups. A significant increase in the frequency of chromosomal aberrations was also observed with increase in age in both control and exposed subjects (Fatima et al. 2001).

●There is good evidence for cement dust exposure acting as a tobacco, alcohol and asbestos independent risk factor for laryngeal carcinoma (Dietz et al. 2004).

●As the cement dust comes in contact with water, hydroxides are formed that impair natural water alkalinity. A fine layer of cement covers the surface of wells and ponds. The addition of salts of Ca, Na, K, Mg and Al as hydroxides, sulfates and silicates affect the hardness of the water that subsequently are responsible for the respiratory and gastro-intestinal diseases in the area (Mishra 1991).

●The results obtained from the analysis of the production process and of the exposure levels determined by the cement workers showed that it is possible to reconstruct the history of exposure to cement dust during each worker's occupational history. The results also showed that estimated exposure is related to respiratory damage; higher exposure resulted in more serious diseases (Alvear-Galindo et al. 1999).

CONCLUSION:

As the number of factories grew with the thousands of people coming in from the rural areas seeking better paying jobs, shelters and rooms became overcrowded where a room would be rented to whole family. Houses were overcrowded and If there were no rooms to be rented, then people would bunch up in lodging houses. Workplaces were overcrowded and in bad sanitary conditions (women and young children were also employed and were working in these conditions) where there were no proper running water to bathe regularly. The cities didn't have a proper planned sewage and garbage collecting system. The cities were also covered by layer of dirty black smoke (from burning coal that was used to heat water so as to create steam to run the machines) often covered the streets. The factories chimneys would continually belched out these dark, dirty and poisonous smoke into the atmosphere, polluting it. This blocked out most of the Sun's light giving the city a bleak and gloomy look. Due to this rapid urbanization that led to overcrowd cities it caused a health crisis. Water pollution carried water borne disease, Cholera manifested and spread over the population killing thousands. No one knew exactly what caused this disease until about 1855 when John Snow, a London physician, traced a part of the cholera epidemic to a contaminated water pump on Broad Street.

REFERENCES:

1) Adak, M. D., S. Adak and K. M. Purohit (2007). "Ambient air quality and health hazards near mini cement plants." Pollution Research 26(3): 361- 364.
2)Al-Neaimi, Y. I., J. Gomes and O. L. Lloyd (2001). "Respiratory illnesses and ventilatory function among workers at a cement factory in a rapidly developing country." Occupational Medicine 51(6): 367-373.
3) Chapela-Mendoza, C.-A. Eslava-Campos and A.-C. Laurell (1999). "Risk Indicator of Dust Exposure and Health

Effects in Cement Plant Workers." Journal of Occupational and Environmental Medicine 41(8): 654-661.
4) Aydin, S., S. Aydin, G. Croteau, Í. Sahin and C. Citil (2010). "Ghrelin, Nitrite and Paraoxonase/Arylesterase Concentrations in Cement Plant Workers." Journal of Medical Biochemistry 29(2): 78-83.
5) P. Shrivastava, S. R. Nath, S. S. Kumar, D. Singh and K. Vivek (2008). "Impact of dust emission on plant vegetation of vicinity of cement plant." Environmental Engineering and Management Journal 7(1): 31-35.
6) Dietz, A., H. Ramroth, T. Urban, W. Ahrens and H. Becher (2004). "Exposure to cement dust, related occupational groups and laryngeal cancer risk: Results of a population based case-control study." International Journal of Cancer 108(6): 907-911.
7) Fatima, S. K., P. A. Prabhavathi, P. Padmavathi and P. P. Reddy (2001). "Analysis of chromosomal aberrations in men occupationally exposed to cement dust." Mutation Research/Genetic Toxicology and Environmental Mutagenesis 490(2): 179-186.
8) Lal, B. and R. S. Ambasht (1982). "Impact of cement dust on the mineral and energy concentration of Psidium guayava." Environmental Pollution Series A, Ecological and Biological 29(4): 241-247.
9) Mishra, G. P. (1991). "Impact of industrial pollution from a cement factory on water quality parameters at Kymore." Environment & Ecology 9(4): 876-880.
10) Murugesan, M., A. Sivakumar, N. Jayanthi and K. Manonmani (2004). "Effect of cement dust pollution on physiological and biochemical activities of certain plants." Pollution Research 23(2): 375-378.