ENVIRONMENTAL ANALYSIS WITH RESPONSE TO AIR

Dr. Dina Krishna Joshi*

Abstract:-

This paper presents the analysis and the study of air and its implications of the distribution in terms of potential environmental injustice. We consider the recent history of the environmental justice debate in the global level and in the light of this, how one aspect of air pollution, nitrogen dioxide levels, affects different population groups differentially across the world. We also estimate the extent to which people living in each territory contribute towards this pollution, with the aid of information on the characteristics of the vehicles they own. Pollution is most concentrated in areas where young children and their parents are more likely to live and least concentrated in areas to which the elderly tend to migrate. Those communities that are most polluted and which also emit the least pollution tend to be amongst the poorest in different regions. There is therefore evidence of environmental injustice in the distribution and production of poor air quality in different parts. However, the spatial distributions of those who produce and receive most of that pollution have to be considered simultaneously to see this injustice clearly.

Key words: - Environmental injustice, Air quality, Global level

* Post Doctoral Scholar, Gayatrinagar, New Bus Stand, Junagarh, Kalahandi, Odisha, 766 014

Introduction-

Human being breathes in large volume of air each day in order to live. Any contamination of the atmosphere is of utmost importance. However, the assessment of the air quality is difficult because the nature of atmospheric pollution ranges from visual restrictions to toxic gases and vapours. Some gases are water soluble and are lost in condensed vapour during sampling; others are very prone to sorption on fine solid particles. So, the technique used to monitor air quality varies from very crude to highly sophisticate one. Blowing air is called as wind. The wind is considered to be an important ecological factor of atmosphere because it is known to alter numerous other environmental factors such as temperature, light, water balance, etc. It also influences animal and plant life. Physical parameters like Wind velocity can be measured by an instrument anemometer, Atmospheric pressure by barometer, minimum and maximum temperature by thermometer and Humidity by psychrometer. Like Physical parameters, Chemical parameters can not be measured easily. The mixture of gases together with small amounts of finely divided particles of liquids and solids that envelops the entire earth to an indefinite altitude. Water vapour is normally present in air to varying concentration. Dusts and aerosols are common in air and constitute serious pollutants at times. The numerous gas analysers are available in the market which are simple, convenient to use and reliable. Particulates are also found in both solid and liquid forms in air. The common solid forms are dust, fumes and smoke where as common liquid forms are fog and mist. There are also particles which are larger than a molecule but small enough to get dispersed in air which are called aerosols. Air borne particulates are responsible for causing certain diseases such as allergic asthma, bronchitis, fibrosis of lungs, etc.

Method to evaluate the particulate matter-

The following methods are used to evaluate the particulate matter:

1. Gravitational method-

The method could be used for evaluating the dust particles of one micron or larger size within a city or an industrial shed. In this method, the clean glass jars of known open area are kept in the atmosphere where dust fall is to be estimated. After some hours or days, the dust is collected from each jar and is then weighed. Then, average weight of dust is found in each jar and the result of dust fall is expressed as weight of dust per unit area per unit time.

2. Impaction method-

This method uses the cascade impactor. The principle underlying this method is that particles are not able to follow the directional changes and get compacted to which they hit. The main limitation of this method is is that this impactor fails to collect very small particles.

By using a suction pump, a known volume of air is drawn through a slit or yet in an impactor device. When a considerable volume of air has passed through the cascade impactor, the section is shopped and the particles collected in the cascade impactor are weighed. It is also possible to count the dust particles by observing then through a microscope. The result is expressed as weight of dust and number of particles per unit volume of air.

3. Electrostatic precipitation method-

This method uses an electrostatic precipitator which consists of an ionizing electrode charged with high negative potential and a collector to be maintained as

positive potential produced by a special transformer and rectifier. In this method a known volume of air is allowed to pass trough the precipitator where the incoming particles become negatively charged by the electrode and get adhered to the positively charged collecting tube. The collected particles are weighed and their number could be counted by using a microscope.

4. Filtration method-

In this method, a large volume of air is allowed to pass through a pre-weighed glass filter. Then this filter is weighed to know the trapped dust particles. From this, it is possible to calculate the particulate matter per unit volume of air. By using this method, it is possible to measure the particles as small as 0.05.

Laboratory method for determination of particulates-

Particulates can be estimated using high volume sampler. This consists of an electric motor and a pump. A gas meter attached to this unit would indicate the volume of air pumped the sampler.

This is fitted with a filter made up of glass fibres and the outlet of the pump is connected with the filter. The sampler is capable of handling large volumes of air. When air is allowed to pass through the filter, particles of diameters in the range 0.1-100 micron are collected on the filter. The difference in the weight of the filter before and after the passage of air will give the amount of particulate matter in the air.

Determination of gaseous pollutants-

Gaseous pollutants can be quantified in the atmosphere in three main ways:

1. Sample could be collected in an evacuate vessel or a plastic bag and transported back to the laboratory for analysis. This method finds use to give the concentration of pollutant in the atmosphere at the instant the sample was taken, provided the sample has been a representative one. The time delay between taking the grab sample and making the actual measurement can cause losses of sample by preferential absorption on the surface of the container, or by preferential diffusion out of the container in case of plastic bags. The problems could be overcome by preconditioning the containers with the atmosphere being sampled, using plastic which have been known to be impermeable to the gas of interest and by doing the analysis as soon as possible after sampling.

2. Samples could be collected and concentrated at the same time by preferential absorption onto solid absorbents, absorption into solution, freezing out components at selected temperatures, or some combination of all these three. Samples then get returned to the laboratory for analysis. Problems here can occur because of concentrating reactive pollutants, increasing their change of reaction before analysis.

3. Finally, it is possible to determine concentrations continuously using a physical property of the gas being measured, or a physical property of the product of a specific controlled reaction of the gas being measured.

Wet chemical methods for determination of gaseous pollutants-

The most commonly used non-instrumental methods for the relative gases have been those involving collection in solution with reaction, referred to as wet chemical methods.

1. Carbondioxide-

It acts as a raw material in the photosynthesis of plants. Photosynthesis in many plants could get increased with the moderate increase in carbon dioxide concentration. A high carbon dioxide concentration in air, however, is able to impair normal respiratory activity of the organisms.

The main reservoir pool of biospheric carbon dioxide has been lying in carbonate system of the oceans. Respiratory activities of organisms together with decomposition accelerated by man's activities such as burning of fuel and agricultural practices also add to the atmospheric carbon dioxide. Although the carbon dioxide injected into air by man's agro-industrial activities has been quite small in comparison to the total carbon dioxide in circulation yet it is starting to have perceptible effect because the atmospheric reservoir is small and the larger oceanic reservoir will not absorb the carbon dioxide at the rate it has been produced by man. The most commonly used method for determining atmospheric carbon monoxide is non dispersive infrared analysis.

2. Carbon monoxide-

The major toxic component is carbon monoxide. When cars are cruising, the exhaust gases generally contain carbon monoxide but when engines are idling or accelerating concentrations can increase to five per cent or more.

It has been an important gaseous pollutant injurious to health. It reacts about 300 times faster than does oxygen with haemoglobin in blood to form carboxy-haemoglobin which smpairs normal oxygen transport by blood. Low level of CO poisoning may produce symptoms like reduction in reaction time, psychomotor impairment , headache, dizziness, and lassitude. At high level it may bring about nausea, heart palpitations, difficulty in breathing and even death. One analytic

procedure widely used for monitoring purposes utilizes the fact that CO molecules selectively absorb some bands of infrared radiations. So, infrared Analysis system is used.

3. Nitrogen oxides-

Nitrogen oxides appear in engine exhaust at concentration ranging from greater than 30ppm during idling to less than 1000 ppm during cruising and acceleration, and indicate the important role these oxides play in smog formation, despite their comparative low concentration in air. The nitrogen dioxide becomes part of air on burning of fossil fuel automobile power plants, and by the action of ultraviolet rays in the atmosphere it gets reduced to nitrogen monoxide and atomic oxygen. Atomic oxygen reacts with oxygen molecule forming ozone. Nitrogen oxides content may be determined by Scrubbing method.

4. Sulphurdioxide-

Sulphurdioxide content of the atmosphere contains contributions from industry, power stations and motor vehicles. It has been one of the common gaseous pollutants. It goes in air mainly from combustion of petroleum and coal. The pollutant has been somewhat injurious to health as it brings about irritation of eyes and epithelium, pharyngitis, cough, headache and breathing troubles. In the atmosphere sulphur dioxide combines with moisture to form sulphuric acid which may precipitate as acid rain- injurious to human health and plant life. New castle method is used to determine Sulphur dioxide.

5. Hydrocarbons-

The unburnt hydrocarbons present in engine exhaust gases consist mainly of alkanes, akenes and aromatic compounds together with their products of partial

oxidation. Since the concentration of these hydrocarbons reaches a peak with early morning traffic flows, the quality control limit specifies a mean value for a three hour period. At later hours sunlight promotes a series of photochemical reactions and leads to the formation of secondary pollutants such as nitrogen dioxide, ozone, aldehydes, ketones, peroxyl nitrates and alkyl nitrates. These secondary products give rise to photochemical smog.

The separation and identification of the hydrocarbon species is generally based on gas chromatography or mass spectrometry.

6. Lead-

The standard analysis for atmospheric lead is based on the dithizone method. The sample is collected on a 0.45 (Mu) m membrane filter. If it is desired to trap gaseous lead compounds a tube filled with iodine crystals may be used after filtration. The filtered sample is digested with Nitric acid and sulphuric acid to solubilize the lead. Iodine crystals are dissolved in acid KI and reduced with sulphite. Again the lead is solubilized. Acidic Pb^{2+} from either source is made basic with ammonia and extracted with a chloroform solution of dithizone. Mass spectrometry is also important in lead analysis because it can be used to determine the source of the element.

Conclusion-

In India is a serious issue with the major sources being fuel wood and biomass burning, fuel adulteration, vehicle emission and traffic congestion which are the main factors for production of poisonous gases. India has a low per capita emissions of greenhouse gases but the country as a whole is the third largest after China and the United States. A 2013 study on non-smokers has found that Indians have 30% lower lung function compared to Europeans. The Air (Prevention and

Control of Pollution) Act was passed in 1981 to regulate air pollution and there have been some measurable improvements. However, the 2012 Environmental Performance Index ranked India as having the poorest relative air quality out of 132 countries.

Fuel wood and biomass burning is the primary reason for near-permanent haze and smoke observed above rural and urban India, and in satellite pictures of the country. Fuel wood and biomass cakes are used for cooking and general heating needs. These are burnt in cook stoves in some parts of India. These cook stoves are present in over 100 million Indian households, and are used two to three times a day, daily. Majority of Indians still use traditional fuels such as dried cow dung, agricultural wastes, and firewood as cooking fuel.

This form of fuel is inefficient source of energy, it's burning releases high levels of smoke particulate matter, polyaromatics, formaldehyde, carbon monoxide and other air pollutants. Some reports, including one by the World Health Organization, claim 300,000 to 400,000 people die of indoor air pollution and carbon monoxide poisoning in India because of biomass burning. The air pollution is also the main cause of the Asian brown cloud which is delaying the start of the monsoon. Burning of biomass and firewood will not stop, unless electricity or clean burning fuel and combustion technologies become reliably available and widely adopted in rural and urban India. India is the world's largest consumer of fuel wood, agricultural waste and biomass for energy purposes.

Fuel wood, agri waste and biomass cake burning releases over 165 million tonnes of combustion products into India's indoor and outdoor air every year. The fuel wood sourced residential wood smoke makes up over 50 percent of the wintertime particle pollution problem in California. In 2010, the state of California had about the same number of vehicles as all of India. India burns tenfold more

fuel wood every year than the United States, the fuel wood quality in India is different than the dry firewood of the United States, and the Indian stoves in use are less efficient thereby producing more smoke and air pollutants per kilogram equivalent. India has less land area and less emission air space than the United States. In summary, the impact on indoor and outdoor air pollution by fuel wood and biomass cake burning is far worse in India.

A United Nations study finds firewood and biomass stoves can be made more efficient in India. Animal dung, now used in inefficient stoves, could be used to produce biogas, a cleaner fuel with higher utilization efficiency. In addition, an excellent fertilizer can be produced from the slurry from biogas plants. Switching to gaseous fuels would bring the greatest gains in terms of both thermal efficiency and reduction in air pollution, but would require more investment. A combination of technologies may be the best way forward. Biomass burning, as domestic fuel in India, accounts for about 3 times as much black carbon air pollution as all other sources combined, including vehicles and industrial sources.

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