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APPLICATION OF STATISTICAL METHODS IN ENVIRONMENTAL ETHICS

Shri. Sanjay Karande

Assistant Professor in Statistic

Sathaye College (Autonomus, Vile Parle (E) Mumbai)

Abstract:

Air pollution is responsible for 1 in 8 deaths worldwide. Her 3.3% of global GDP is affected by economic losses due to air pollution. 99% of the world's population lives in places where air pollution exceeds limits set by the World Health Organization. Pollution and domestic air pollution kill 6.7 million people a year. This paper aims to understand environmental ethics using various statistical techniques. Various global environmental problems are explained by statistical methods. Only the major countries of the world are considered in this study. Major pollutants include PM 2.5, carbon dioxide, ozone layer depletion, forest areas, greenhouse gas emissions, nitrogen oxide emissions, and sulfur dioxide emissions. We know that harmful emissions are declining in many developed countries, but the trend is reversing in developing countries. This study seeks to explain how major countries are influencing and controlling these pollutants. Forecasts are made using time series analysis. For this study, secondary data is taken from The Organization for Economic Cooperation and Development (OECD) and Department of Economic and Social Affairs Statistics, United Nations. In the study, we see that Delhi is the most polluted city in India. In last 5 years, deforestation was highest in Brazil. India ranks her second in deforestation. According to 2019 data, China is the country with the highest carbon emissions, followed by the United States and India.

Key words: *Pollutants, Forecasting, Environment*

Introduction :

Air pollution accounts for one in eight deaths worldwide. 3.3 % of world GDP is impacted by economic losses due to air pollution. 99% of the world's population lives in places where air pollution levels exceed the limits set by the World Health Organization. 6.7 million deaths a year caused by exposure to ambient and domestic air pollution.[6] Air pollution is now one of the world's most important and avoidable health risks. It has been dubbed the 'silent killer' by the World Health Organization (WHO) because its effects are often overlooked, not easily measured, and not associated with public health problems. But air pollution is the leading cause of premature death. Another recent WHO warning concerns the fact that he 90% of the world's population breathes inadequate air. This fact has not had the expected impact. Air pollution is responsible for about 4.2 million deaths in 2015. Air pollution also killed more than 100 million years of life when adjusted for years of disability (DALYs). The European Environment Agency (EEA) says that exposure to particulate matter and gaseous pollutants above

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recommended levels is still very common in many countries and has a significant negative impact on our health. reporting. The exposome is changing rapidly these days due to changes in how we work and live[1].

Air pollution is known to damage the lungs and airways, but it can also damage most other organ systems of the body. Air pollution is responsible for approximately 500,000 lung cancer deaths and 160 Estimated to be responsible for 10,000 COPD deaths, air pollution may also be responsible for 19% of all cardiovascular deaths and 21% of all stroke deaths. Air pollution is associated with other malignancies such as bladder cancer and childhood leukemia. Childhood lung development is disturbed by exposure to air pollutants, and poor lung development in children predicts lung injury in adults. Air pollution is associated with cognitive decline and an increased risk of dementia[2].

Exposure to outdoor fine particulate matter concentrations is recognized as a major global health concern. It is primarily based on excess mortality estimates using information that aggregates exposure and risks from multiple particle sources (outdoor and indoor air pollution, passive/active smoking). Such integration requires a strong assumption of the same toxicity per total inhaled dose. Create a risk model that relaxes these assumptions and examines exposure and risk information. This model has been limited to outdoor air pollution cohort studies and now covers much of the global concentration range. Our estimates are many times larger than previous calculations, suggesting that outdoor particulate air pollution is an even more important risk factor for human health than previously thought. Increase[3].

The pulp and paper (PPI) industry produces vast amounts of wastewater that is heavily contaminated with various contaminants. One of the largest sources of pollution is PPI wastewater and wastewater after secondary treatment. PPIs contain high concentrations of various organic and inorganic contaminants. PPI is the sixth most polluting industry in the world and produces large amounts of hazardous wastewater after paper production. Discharged wastewater contains 40-45% raw materials such as chlorophenols, pesticides, chlorinated phenols, choriogenin, chlorinated resins, fatty acids, lignocelluloses and biocides, all of which are classified. increase. The industrial sector uses 34 billion m3 of water annually, which is expected to triple by 2050.[4]

Data sources :

1.The Organization for Economic Cooperation and Development (OECD)

2. Department of Economic and Social Affairs Statistics, United Nations.

Various Pollutants and Statistical Analysis :

1. HAB :

Harmful algal blooms (HAB) (or algal overgrowth) are algal blooms that adversely affect other organisms through the production of natural toxins produced by algae, mechanical damage to other organisms, etc. HABs are sometimes defined as algal blooms that produce toxins, or as algal blooms that significantly reduce oxygen levels in natural waters and can kill marine or freshwater organisms. Flowering can last from several days to several months. After the bloom dies, the microbes that decompose the dead algae consume more oxygen, creating dead zones that can lead to fish death. Plants can no longer survive. Harmful algal blooms in marine environments are often referred to as red tides.

To examine the effects of HAB, we examined data from around the world and only looked at the top 5 countries with the highest HAB increase and the top 5 countries with the highest decrease over the past 5 years from 2015 to 2020, as shown in Table 1. Considered. From Figure 1, we can see that HAB levels increase in developing countries such as Bangladesh, Thailand,

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Myanmar, Japan and India, and decrease in Western countries, the United States, Germany, Italy, Turkey and Russia. A time series analysis is also performed for each of these countries to estimate trends over the next five years. Linear regression fitted the data well for all these countries, except for Brazil, where polynomial regression was used. Forecasts can be calculated using the regression equation shown in the figure.1

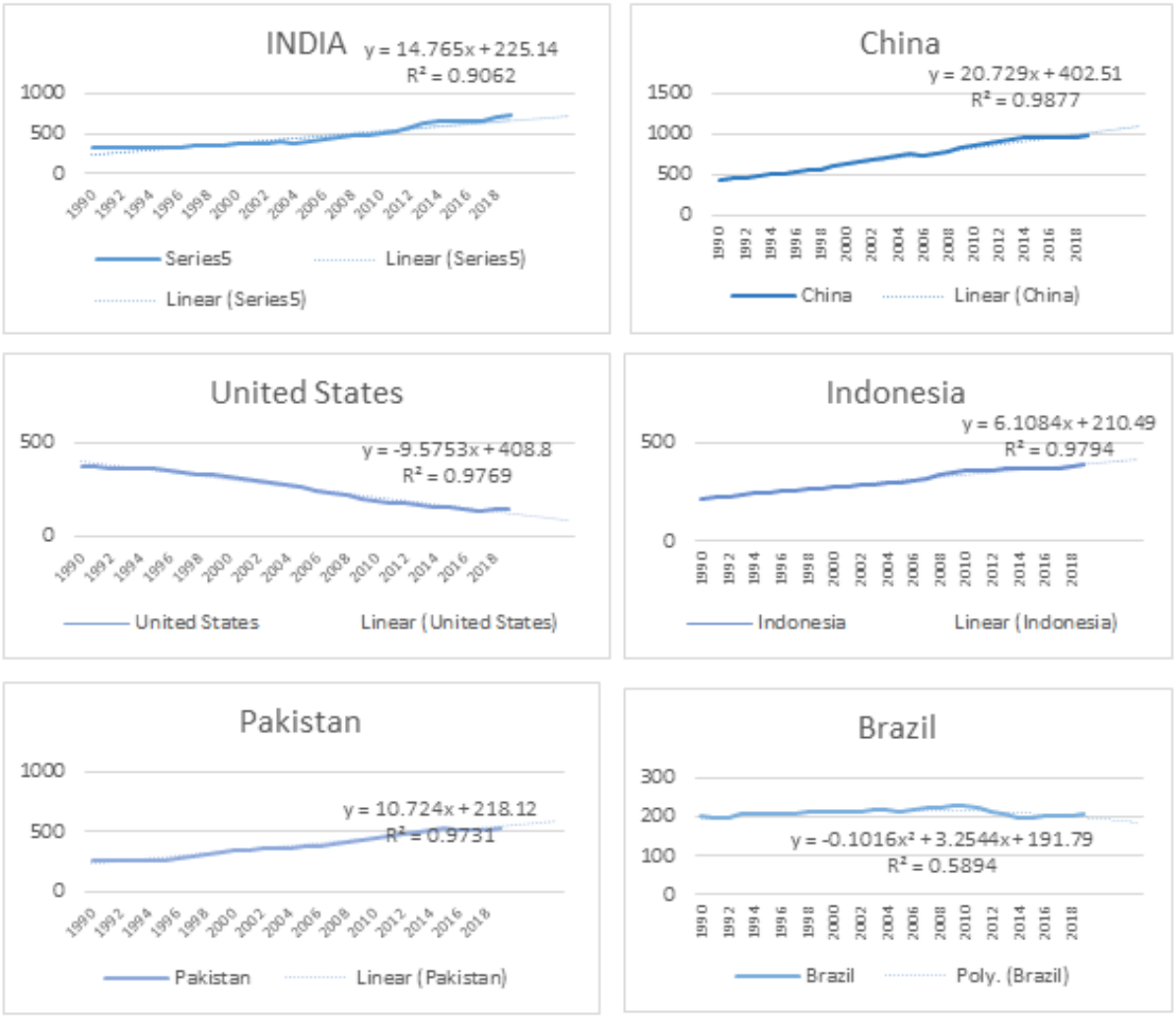

Fig 1.: major countries showing increasing and decreasing trend in HAB

Country	Bangladesh	Thailand	Myanmar	Japan	India	USA	Germany	Italy	Turkey	Russia
% Change	17%	14%	8%	8%	8%	-7%	-8%	-8%	-9%	-20%

Table 1.: Top 10 countries with increase and decrease in HAB.

Carbon dioxide :

Carbon emissions have a major impact on the planet as they are the most greenhouse gases emitted into the atmosphere. Of course, this causes global warming and ultimately climate change. Carbon dioxide is released into the atmosphere when fossil fuels (coal, natural gas, oil) are burned. However, the combustion of other biological materials also releases carbon dioxide: solid waste, trees, etc.

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Figure 2 shows the 10 countries with the highest carbon emissions. According to 2019 data, China is the country with the highest carbon emissions, followed by the United States and India.

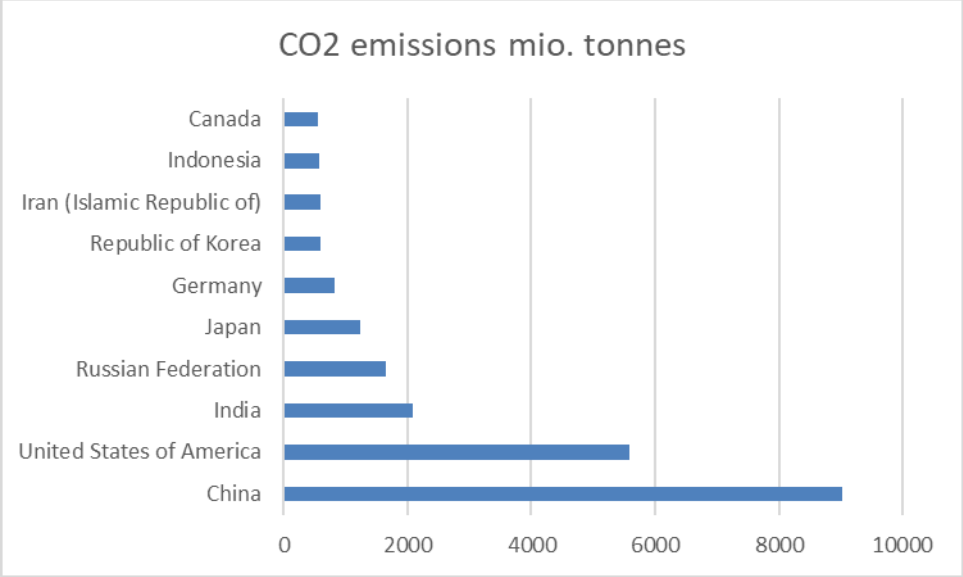

Fig.2 Top 10 countries with increase CO_2 emission in 2019 (unit : million tons)

3. Forest:

Forests are defined as trees over 0.5 hectares of land with trees greater than 5 meters tall and with a crown coverage greater than 10%, or trees placed above these thresholds and within reachable locations. increase. Land used primarily for agricultural or urban purposes is not included. Forests are defined both by the presence of trees and the absence of other major land uses. Trees should reach a height of at least 5 meters. This includes areas with young trees that have not yet been reached but are expected to achieve a canopy of at least 10% and a height of 5 meters or more. It also includes areas that are temporarily depleted due to clearcutting as part of forest management practices or natural disasters and are expected to regenerate within five years. In exceptional cases, local conditions may justify a longer period. Forests in protected areas such as national parks, nature reserves and those of special ecological, scientific, historical, cultural or spiritual interest. This includes windbreaks, protection belts and tree corridors with an area of more than 0.5 hectares and a width of more than 20 meters. This includes abandoned excursions regenerated with trees over 10% canopy and over 5 meters tall. Includes areas of intertidal mangroves, whether classified as terrestrial or not. Includes rubber tree, cork oak and Christmas tree plantations. Areas with bamboo and palm trees are included if land use, height and canopy criteria are met. Tree stands in agricultural production systems such as orchards, oil palm plantations, olive groves, and agroforestry systems are excluded if they are grown under cover. NOTE: In some agroforestry systems, such as the 'Taungya' system, crops are grown only in the first few years of forest succession and classified as forest. Total land area is the total area of a country minus the area covered by inland waters. Like big rivers and lakes. Deforestation is the conversion of forest to another land use or the long-term reduction of canopy cover below a threshold of 10%.

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Fig. 3 shows in last 5 years, deforestation was highest in Brazil. India ranks her second in deforestation.

Country and Area	Deforestation, 2015-2020
WORLD	10200
Brazil	1695.7
India	668.4
Indonesia	650
United Republic of Tanzania	474
Myanmar	293.92
Paraguay	279.34
Mozambique	267.03
Sudan	264
Bolivia	242.54
Colombia	199.23

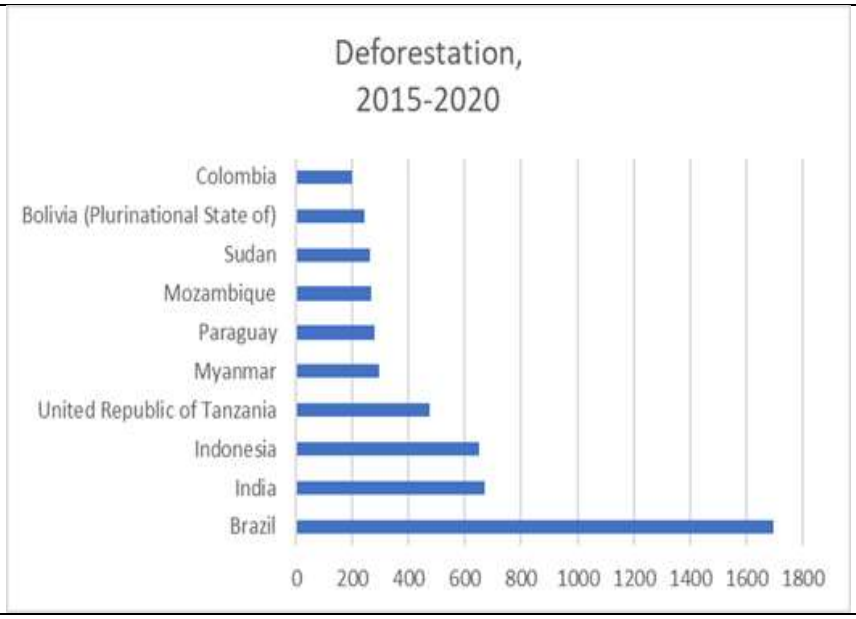

Fig. 3 Top 10 countries with maximum deforestation 2015-2020 (Unit : 1000 ha/year)

➢ **Facts about pollution in INDIA :**

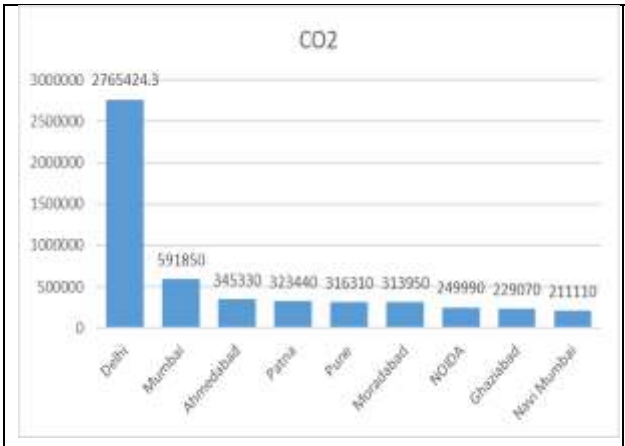

Fig 4 : CO_2 emission major cities in India 2022

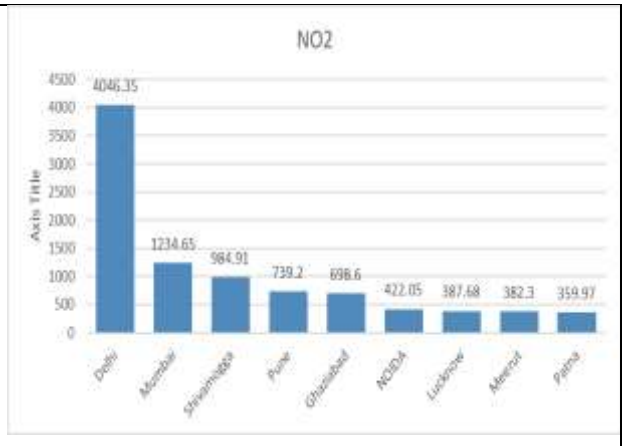

Fig 5: NO_2 emission major cities in India 2022

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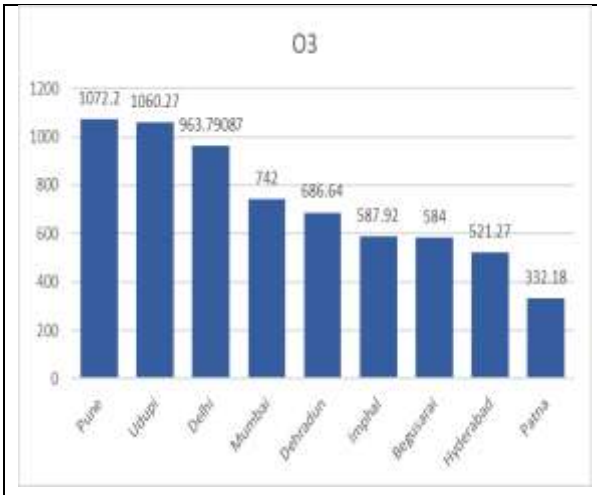

Fig 6 : ozon affected major cities in India 2022

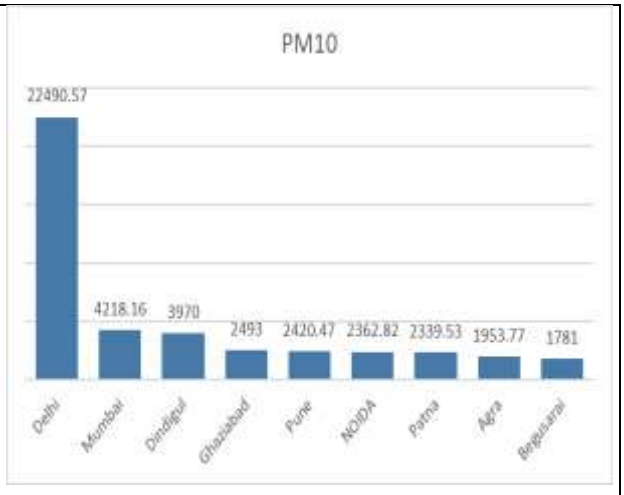

Fig 7 : PM10 major cities in India 2022

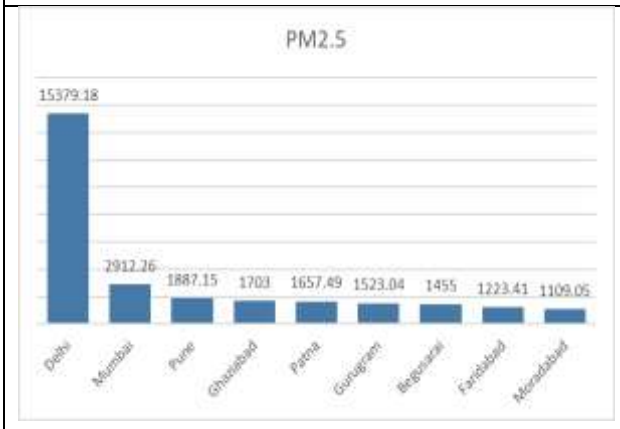

Fig 8 : PM2.5 major cities in India 2022

	CO2	NO2	O3	PM10	PM2.5	SO2
CO2	1					
NO2	0.978093	1				
O3	0.643748	0.722895	1			
PM10	0.99062	0.983923	0.642184	1		
PM2.5	0.990722	0.982281	0.654207	0.997488	1	
SO2	0.901291	0.922541	0.812467	0.889733	0.893003	1

Fig 9 : Correlation matrix of pollutant in India 2022

Graphs for India are based on secondary data available on the Department of Economic and Social Affairs Statistics, United website.

From the fig.4 we can see that in India's large cities, Delhi alone contributes 24 percent of carbon dioxide emissions. Also, from the remaining figures, Delhi is top for pollutants such as NO_2, PM2.5 and PM10. New Delhi's current PM2.5 concentration is 9.5 times the recommended limit set by the WHO's 24-Hour Air Quality Guidelines.[5] PM2.5 air pollution in New Delhi is estimated to cause 25,000 deaths as of 1 January 2021. It has cost the city's economy about $3.7 billion so far this year. (Source: Greenpeace). From the above graphs, we can see that Delhi is most polluted city in India for almost all the pollutants except Ozone. Surface ozone is highest in Pune compare to Delhi and all other cities in India from fig.6

Conclusion :

Air pollution accounts for one in eight deaths worldwide. 3.3 % of world GDP is impacted by economic losses due to air pollution. 99% of the world's population lives in places where air pollution levels exceed the limits set by the World Health Organization.

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6.7 million deaths a year caused by exposure to ambient and domestic air pollution.

Harmful algae blooms (HAB) increase at the highest levels in Bangladesh, followed by increases in Thailand, Myanmar, Japan and India, a dramatic decline in Russia, and a modest decline in Turkey, Italy, Germany and the United States. . Statistical techniques such as time series analysis can be used to estimate changes over the next few years.

According to 2019 data, the country with the highest CO2 emissions is China, followed by the United States and India. Over the past five years, deforestation has been the highest in Brazil. India ranks second in deforestation.

Delhi alone accounts for 24% of carbon emissions. As for the rest of the numbers, Delhi is also a leader in pollutants such as NO2, PM2.5 and PM10.

References :

Jose Chatkin, Liana Correa, Ubiratan Santos ; External Environmental Pollution as a Risk Factor for Asthma ; Clinical Reviews in Allergy & Immunology (2022) 62:72–89

Dean E. Schraufnagel et al; A Review by the Forum of International Respiratory Societies' Environmental Comittee. Part 2: Air Pollution and Organ Systems; article in press ; Air Pollution and Noncommunicable Diseases.

Burnett et al. ; Global estimates of mortality associated with longterm exposure to outdoor fine particulate matter ; PNAS

Pooja Sharma , Hafiz M.N. Iqbal , Ram Chandra ; Evaluation of pollution parameters and toxic elements in wastewater of pulp and paper industries in India: A case study ; Case Studies in Chemical and Environmental Engineering 5 (2022) 100163.

https://www.aqi.in

https://www.getambee.com

https://www.who.int

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