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Comparative Study on Air Quality Index and Air Pollution Levels in Major Zones of Ernakulam City

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Abstract – *As we know air is one of the important and vital component that is needed for the survival of mankind. The air around us is mainly made up of many gases and dust particles. This air is often polluted by gases such as smoke, and ash etc. This air pollution creates serious problems such as acid rain, smog, and global warming. It has the power to damage human health too. A slight change in air components affect the growth and developmental needs of various organisms in this planet. Air pollution index is an overall strategy which is used to transform the weighted values of individual air pollution parameter to a single number. The continuous exposure of people into various air pollutants such as particulate matter (PM), carbon monoxide, sulphur dioxide, etc has created many health issues. In Kerala, construction dust could be the important sources of air pollution. The vehicular emission across various places of Kerala has played an important role in the air quality deterioration. In this paper, it mainly focuses the previous year data's provided by Kerala state pollution control board (KSPCB)in various residential, commercial and industrial zones. Different methods to evaluate the air quality index and a case study of Maradu in Ernakulam.*

Key words: **Air pollution, Kerala, Kerala state board pollution control, Vehicular emission, Air quality index.**

1. INTRODUCTION

Air is one of the important and vital component that is needed for the survival of mankind. A slight change in air components affect the growth and developmental needs of various organisms in this planet. This polluted air has lot of severe impacts on various fields. It is very necessary to monitor the air quality standards of various zones of the city. It is very necessary to monitor the previous year data's along with the present monitoring data's. According to the data provided by central pollution control board (CPCB), in cities like Delhi, Mumbai, Chennai, Bangalore shows that the major pollution contributed by transportation sector.

The polluted air causes several disorder such as eye irritation, lung disorders, or can even cause premature death. Hence proper monitoring methods must be conducted to study and evaluate the quality of air. Air pollution can be visualized as a mixture of gases, particles, water vapour, aerosols which are mainly generated due to human deeds and other natural or anthropogenic matters.

Air quality index is a simple and commonly used method to evaluate the overall air pollution of a region. Air quality in various parts of ernakulam city is being regularly monitored by kerala state pollution control board.the industrial, residential and commercial sites selected in the city are some fact compounds, Eloor, Vytilla, Ernakulam south. respectively. From various sites the recorded average SPM levels did not exceed the concentration level of $200\mu g/m^3$.

2. Air Quality Index (AQI)

It is an index used for calculating and reporting daily air quality. It makes us aware about how unhealthy is the air we breathe and what are the health effects might be a concern. The four major air pollutants that is regulated by the clean air act such as ground level ozone, particle pollution, carbon monoxide and sulphur dioxide is calculated by AQI. AQI is divided into six levels of health concern, and they are:

Table – 1: The EPA provided data showing AQI health levels.

Air Quality Index (AQI) Values	Levels of health concern	Colors
When the AQI in this range.	….air quality conditions are.	…as symbolized by this color.
0 – 50	Good	Green
51 – 100	Moderate	Yellow
101 - 150	Unhealthy for sensitive groups	Orange
151 – 200	Unhealthy	Red
201 – 300	Very unhealthy	Purple
301 – 500	Hazardous	Maroon

different methods to calculate the ambient air quality index are of the following:

1. AQI = $\frac{(AQI_{Hi})-(AQI_{Lo})}{(Conc_{Hi})-(Conc_{Lo})} \times ((Conc_i) - (Conc_{lO})) + (AQI_{Lo})$

Where,
$Conc_i$ = Input concentration for given pollutant
$Conc_{Lo}$ = The concentration breakpoint, which is less than or equal to $Conc_i$
$Conc_{Hi}$ = The concentration breakpoint, which is greater than or equal to $Conc_i$
AQI_{Lo} = The AQI value corresponding to $Conc_i$
AQI_{Hi} = the AQI value corresponding to $Conc_i$

2. AQI = $(\frac{C}{C_S}) \times 100$

Where
C = Observed value of the pollutants (PM_{10} , $PM_{2.5}$, SO_2 and NO_2)
C_S = CPCB standard for residential area.

3. AQI = $(\frac{W*C}{C_S})$

Where
W = Weight of pollutants
C = The observed value of pollutants
C_S = CPCB standard for residential area

4. AQI = $[39.02 \sum\frac{C}{C_S}]^{0.967}$

C = Observed values of pollutants
C_S = CPCB standard for residential area

3. ZONES OF ERNAKULAM CITY

Ernakulam city is dived mainly to 3 major zones based on pollution as residential, commercial and residential.

RESIDENTIAL ZONE
In residential zone the major cause of pollution is due to the combustion of solid fuels like LPG used for cooking and heating. It causes indoor as well as outdoor pollution. Due to the burning of wood, coal or other fuels can cause severe health consequences like lung cancer, acute stroke, pneumonia and acute heart diseases.

INDUSTRIAL ZONE
An industrial zone contains a number of manufacturing units like iron and steel industry, paper and pulp industry, stone from quarries, lumber from trees. An industry will produce a single usefull product but also generates a huge amount of waste products. These cause air pollution. Sometimes these polluting materials can be converted to one or more usable product, dirt

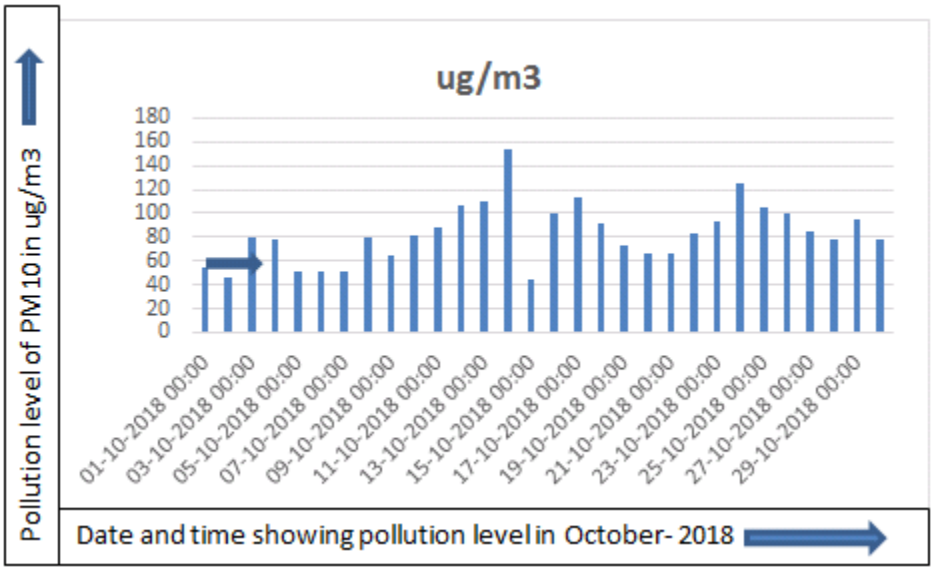
and gravel, oil, solvents, hazardous chemicals, include the types of industrial pollutants. 3 states of industrial waste may be solid, liquid and gaseous. Most of the developed countries have brought in to action various laws restricting the discharge of waste without any treatment. The waste generated will be heavily toxic, highly corrosive like chemicals H_2SO_4, reactive chemicals or even radioactive.

ENVIRONMENTAL IMPACT
Factories and power plants require a large amount of water for the manufacturing process and due to this reason they are located near to water bodies. Water is often used for equipment cooling.

4. INDUSTRIAL ZONE OF ERNAKULAM

ELOOR

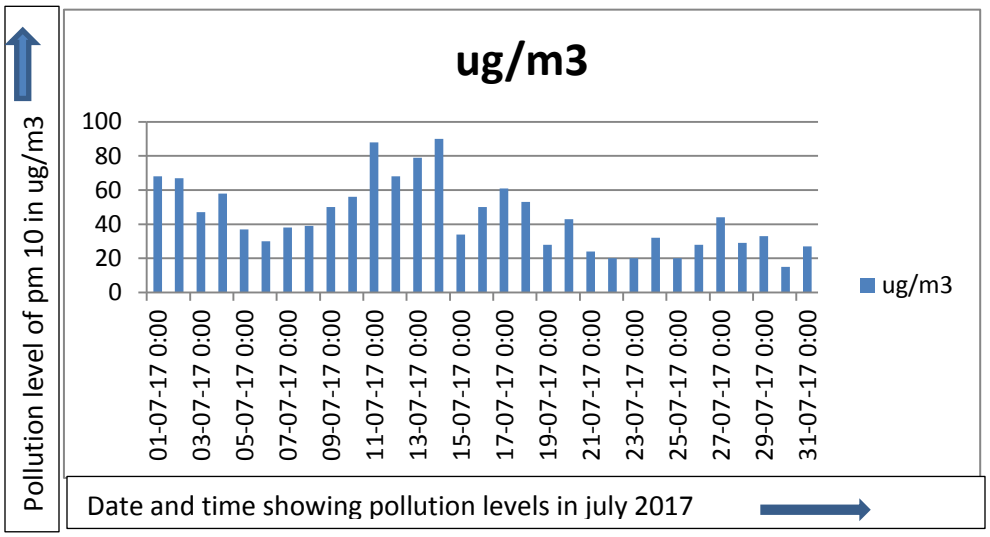
Eloor has the largest industrial belt in Kerala with 247 chemical industries. There are more than 29 effluent pipes producing toxins and are released directly to the river from industries. Air emission include sulphur dioxide, hydrogen sulphide, ammonia and chlorine gas. Eloor is very thickly populated urban area. Almost 40,000 population is affected by the pollution of this area. The various environmental impacts in this area are air pollution, biodiversity, food insecurity, soil contamination, ground water pollution etc. serious health effects like infectious disease, asthma, breathing difficulty other environmental related diseases are common. Socio- economic impacts like loss of livelihood, violation of human rights, loss of landscape occurs. The AQI values goes above the 50 during summer, winter etc.



5. COMMERCIAL ZONE OF ERNAKULAM

VYTILLA

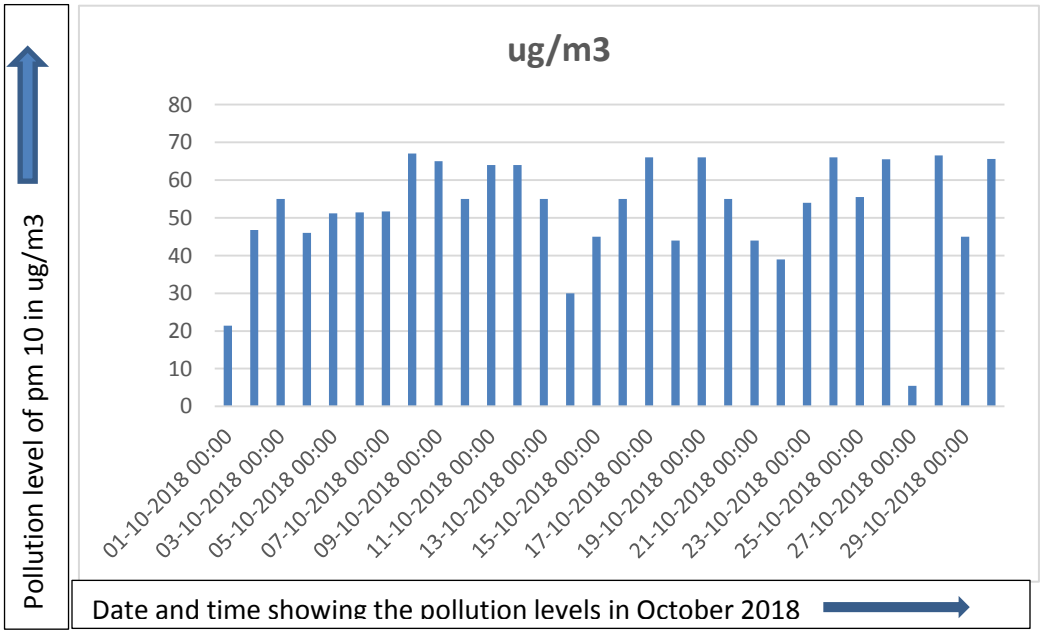
The area which include shops, offices, banks and restaurants etc are classified as commercial zone. The leap in pollution occurred during the period 2013-2017 due to the construction of metro. It was expected to decrease after then as people would themselves depend on public transport rather than using own vehicles. In this way the smoke expelled from vehicles was reduced and caused lesser pollutants into the atmosphere. However the construction of flyover in Vytilla turned this scenario into much worst condition and caused a rapid rise in pollution. Air quality is highly unhealthy in this area.



6. RESIDENTIAl ZONE OF ERNAKULAM

ERNAKULAM SOUTH

This zone comparatively has the highest rank for ambient air quality index during winter season especially in January and February. And its value ranges between 75 to95. This lies in the moderate category of AQI and is capable of causing minor breathing issues to sensitive people. During the monsoon season the AQI value increases slightly but falls in the moderate or satisfactory category and does not cause any health issues.



7. CASE STUDY – MARADU FLAT DEMOLITION

The Maradu implosion effects were not so harmful to the health. But due to this demolition it created tremendous amount of particulate matter. The wind condition of this area enhanced the distribution of dust particles to all parts of the area. After the implosion the value of particulate matter was increased by 1.75 times. The impact limited to 100m radius of the demolished site.

The air quality monitoring devices were installed outside the demolished zone. And are observed for the values of air quality variations. Before implosion the range of particulate matter was 50to 10 but it increased to 100 to 160 after the blast. This value is not higher when compared to places like Vytilla. The impact was reduced by favourable wind condition and spraying of water to remove the dust.

The Kerala state pollution control board said that the demolition dust spread only to maximum distance of 100m and up to 50m height and were settled by evening. According to the report submitted by Kerala pollution control board to state-level monitoring committee on environment, it recorded that the dust generated from maraud demolition contain high rates of total suspended particulate matter.

8. CONCLUSION

The quality of air that is around the environment could be best checked by air quality index.the quality of air decreases when it is mixed with suspended particulate matter. Government and NGO's suggested to reduce pollution rate by planting more trees, usage of public transport rather than private vehicles etc. proper guidelines and awareness must be provide based on the harmful effects of unhealthy environment. The only method to reduce pollution is by adopting various pollution control techniques. That includes the control of emission and effluents into air, water and soil. Adapting to technical changes, is an integral part of any successful industry. Thus different alternative measures and techniques are to be adopted to reduce the pollutants emissions into the atmosphere. The issue of industrial pollution especially concerns every nation on the planet.

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