A Literature Review on Ambient Air Quality Monitoring Near the Solid Waste Disposal Site Harihar Tq, Davangere Dist.

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Abstract - *One of the major drawbacks of solid waste disposal site is air pollution. Hence monitoring of air quality near the solid waste disposal sites is essential and hence predicting concentrations levels of Suspended Particulate matter (SPM) of diameter less than 10micron, SO_2, NO_2 is needed in order to prevent the adverse impacts on health of the workers working over there. This literature review focuses on methodologies used for determining concentration levels of pollutants that may generate air pollution and predict air quality index (AQI) values from the obtained concentrations levels of Suspended particulate matter, Sulphur dioxide, Nitrogen dioxide.*

Key Words*: *Air Quality, Suspended Particulate Matter, SO_2, NO_2, NAAQS, AQI

1. INTRODUCTION

Air pollution can also be the reason for different illness, allergies and even may lead to human's demise. These are also dangerous to towards living organisms such as animals, crop and also affect the natural environment by causing ozone depletion, climate change or built environment such as acid rain. Both the process from nature and activities of human can produce air pollution.

Air pollution can also be a main harmful cause of many of illness such as breathing infections, heart diseases, chronic obstructive pulmonary illness, lung cancer stroke etc. There are many evidences suggesting that air pollution consumption might be linked with IQ scores, impaired cognition, most of the problems of psychiatric disorders for instance depression. Air pollution affects human especially to cardiovascular system and respiratory system. Every responses to the pollutants depends upon the variety of pollutant that is exposed to, level of exposure, genetic and general status of the health.

Most of the population of WHO European province survive in an areas where the concentration of the air pollution has attained certain level that resulting on worse health impacts. Minimizing the impacts on the health is the goal principle of the pollution abetments initiative's run by various entities at various level and encourage by society. Preparing an effective pollution reducing strategy requires identifying the most serious or most prevalent health problems in exposed population. The location of pollution hotspots, the change in the pollution as well as the composition of the pollution are of concern.

Getting an idea for minimizing the pollution focused at creatively conserving public health require more information than knowledge of the location where the odd health affects in terms of kind and predicted number of cases attributes to the pollution, may be important to satisfy and encourage the decisions that might be more expensive and requires more involvement from the society. The CPCB states that 12 parameters (Air Pollutants) are employed to measure the AQI, including NO2 (Nitrogen Dioxide), SO2 (Sulfur Dioxide), CO (Carbon Monoxide), O3 (Ozone), PM10 (Particulate Matter having diameter 10 micron or less), PM2.5 (Particulate Matter having diameter 2.5 micron or less), NH3 (Ammonia), Pb (Lead), Ni (Nickel), As (The majority of cases, the air quality index (AQI) is based on the criterion pollutants (i.e., PM10, PM2.5, SO2, NO2, CO, and O3), however it is better to use many pollutants from the list of 12 pollutants when computing the AQI. However, the choice of pollutants is determined by the AQI objectives, the averaging period, the availability of data, the frequency of monitoring, and the measuring techniques.

A pollutant concentration all through a specific average time from air monitoring or a model is essential for computation. The rate of air pollution is represented by the mixture of

Concentration and time. Epidemiological study shows the clinical effects associated with a definite dosage. Ordinarily, air quality indexes are classed into categories. Each range has a typical public health advisory, a narrative, and color codes.

Air quality index is directly proportional to the rate of emissions. For instance at the peak hours traffic or when there is unwind forest fire or when the air pollution is not been diluted.

2 Objectives

- To Determine the Concentration Levels of Air Pollutants such as Suspended Particulate Matter in Solid Waste Disposal Site of Harihar Taluk, Davangere District and Compare them with the National Ambient Air Quality Standards..

- To Determine the Concentration Levels of Gaseous Pollutants such as Sulphur Dioxide and Nitrogen Dioxide in Solid Waste Disposal Site of Harihar Taluk, Davangere District and Compare them with the National Ambient Air Quality Standards. Determining the Air Quality Index from the Obtained Observations of Suspended Particulate Matter, Sulphur Dioxide and Nitrogen Dioxide and Comparing the AQI Values with NAAQS.

2.1 Formation of AQI values involves two steps

1. Determination of concentration level of suspended particulate matter
2. Determination of concentration of Sulphur dioxide
3. Determination of concentration of Nitrogen dioxide

2.2 Calculation of Suspended particulate matter

$C = (W_1\text{-}W_2) \times 10^6/V$ in $\mu g/m^3$

W_1 = Starting weight in grams of the filter paper

W_2 = Ultimate weight of the filter paper

V = volume of air assessed in m^3

C = concentration of suspended particulate matter in $\mu g/m^3$

2.3 Calculation of Sulphur dioxide

$C\ (SO2 \mu g/m^3) = (A_1\text{-}A_2)*CF*V_1/V_2*V_3$

Where,

C SO_2= Sulphur dioxide's concentration, $\mu g/m^3$

A_1 = Sample's absorbance

A_2 = Reagents blank's absorbance

CF = Caliberation factor

V_2 = Air sampled volume, m^3

V_1 = Sample's volume, ml

V_3 = Volume of aliquot taken for analysis, ml.

2.4 Calculation of Nitrogen dioxide

$C\ (NO_2\ \mu g/m^{3)} = (A_{1\text{-}}A_2)*CF*V_1/V_2*V_3*0.82$

Where,

A_1 = Sample's absorbance

A_2 = Reagent blank samples absorbance

CF = Caliberation factor

V_2 = Air sampled volume, m3

V_1 = Sample's volume, ml

V_3 = Volume of aliquot taken for analysis, ml.

2.5 Calculation of Air quality index (AQI)

$AQI = 1/3[\{SO_2/sSO_2\} + \{NO_2/sNO_2\} + \{SPM/sSPM\}] \times 100$

Where,

SO_2 = Obtained observations of Sulphur dioxide in $\mu g/m^3$

NO_2 = Obtained observations of Nitrogen dioxide in $\mu g/m^3$

SPM = Obtained observations of the suspended particulate matter in $\mu g/m^3$

$sSO_{2,}$ $sNO_{2,}$ sSPM = standardized observations of SO_2, NO_2 and SPM.

Table -1: AQI and possible health impacts

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects

As the AQI rises, as seen in figure 3, so will the likelihood of unfavorable or grave health impacts. The AQI provides an accurate representation of the air around us and indicates the level of air pollution. People can take safeguards against illness risks associated with air pollution by being aware of the AQI and the air quality or pollution in their region or location. In terms of air pollution, India is ranked fifth among 98 nations. Therefore, it is crucial to do research on India's air quality and develop regulations to lessen air pollution.

3. LITERATURE REVIEW

Anikender Kumar, PramilaGoyal (2011) presented the study that forecasts the daily AQI value for the city Delhi, India using previous record of AQI and meteorological parameters with the help of Principal Component Regression (PCR) and Multiple Linear Regression Techniques. They perform the prediction of daily AQI of the year 2006 using previous records of the year 2000-2005 and different equations. After that this predicted value then compared with observed value of AQI of 2006 for the seasons summer, Monsoon, Post Monsoon and winter using Multiple Linear Regression Technique [1]. Principal Component Analysis is used to find the collinearityamong the independent variables. The Principal components were used in Multiple Linear Regression to eliminate collinearity among the predictor variables and also reduce the number of predictors [1]. The Principal Component Regression gives the better performance for predicting the AQI in winter season than any other seasons. In this study only meteorological parameters were considered or used while forecasting the future AQI but they have not considered the ambient air pollutants that may cause the adverse health effects.

Huixiang Liu (et al.2019) have taken two different cities Beijing and Italian city for the study purpose. They have forecasted the Air Quality Index (AQI) for the city Beijing and predicting the concentration of NOx in an Italian City depending on two different publicly available datasets. The first Dataset for the period of December 2013 to August 2018 having 1738 instances is made available from the Beijing Municipal Environmental Centre [5] which contains the fields like hourly averaged AQI and the concentrations of PM2.5, O3, SO2, PM10, and NO2 in Beijing. The second Dataset with 9358 instances is collected from Italian city for the period of March 2004 to February 2005. This dataset contains the attributes as Hourly averaged concentration of CO, Non methane Hydrocarbons, Benzene, NOx, NO2 [5]. But they focused majorly on NOx prediction as it is one of the important predictor for Air Quality evaluation. They used Support Vector Regression (SVR) and Random Forest Regression (RFR) techniques for AQI and NOx concentration prediction. SVR shows better performance in prediction of AQI while RFR gives the better performance in predicting the NOx concentration.

Ziyue Guan and Richard O. Sin not (2018) used the various machine learning algorithms to predict the PM2.5 concentration. Data were collected from the official website of Environment Protection Agency (EPA) for the city Melbourne that contains PM2.5 air parameter and they have also collected the unofficial data from Air beam which is the mobile device used to measure PM2.5 value [8]. The machine Learning Algorithms Artificial Neural Network (ANN), Linear Regression (LR) and Long Short Term Memory (LSTM) recurrent neural network were used for thePM2.5 prediction but out of these algorithms LSTM givesthe best performance ad predict the high PM2.5 value with reasonable Accuracy.

HeidarMaleki (et al.2019) predicted the hourly concentration values for the ambient air pollutants NO2,SO2, PM10, PM2.5, CO and O3 for the stations Naderi, Havashenasi, MohiteZist and Bedsat in Ahvaz, Iran which is the most polluted city in the world. They have also calculated and predicted Air Quality Index (AQI) and Air Quality Health Index (AQHI) for the four air quality monitoring stations in Ahvaz mentioned above. They used Artificial Neural Network (ANN) machine learning algorithm for the prediction of air pollutants concentration (hourly) and two air quality indices AQI and AQHI over the August 2009 to August 2010. Input to ANN algorithms involves the factors such as meteorological parameters, Air pollutants concentration, time and date.

4. Results

Table 2:-Values of the AQI in respected areas during the month of April, May and June

Sl no	Locations of solid waste disposal site	AQI value during the month of March	AQI value during the month of April	AQI value during the month of June
1	NORTH ZONE	36.06	29.89	35.7
2	EAST ZONE	32.2	29.49	31.8
3	SOUTH ZONE	32.9	31.7	32.07
4	WEST ZONE	29.7	31.3	29.4
5	500m away from the SWD site	27.42	26.4	27.14
6	1.5km away from the SWD site	30.65	24.36	30.35

5. Conclusions

Determined the SPM, SO_2, NO_2, and AQI concentrations at the 6 chosen locations neat solid waste disposal site at Harihar taluk in order to resolve this current work. This chapter has discussion of the conclusions drawn from the data and results obtained.

- Based on the locations, it can be presume that in the months of April, May and June the SPM agglomeration is nearer to the limits of SPM prescribed by the NAAQS in an industrial zone and hence it is quite harmful to the workers who are working near the landfill site of Harihar taluk.

- In all locations during the months of April, May and June the SO_2 and NO_2 values were within the NAAQS permissible levels.

The solid waste disposal site is significantly polluted by SPM and hence making it unhealthy for the workers and resulting a variety of health concern

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