"Application of Wind Rose model in Environmental Impact Assessment of Air Quality in Amravati."

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Abstract: There are many situations in which human activities have significant impact on the environment. The health effects due to air qualityhavebeensubjected to intensestudyinrecent years. Exposure to pollutants has been associated with increases lung irritation and damage; aggravates asthma and chronic bronchitis; increases susceptibility to respiratory infections such as the flu and common colds (especially in young children and older adults) study and Application of wind rose model is important for the protection of man, domestic animals, crops materials and it is also necessary to know the trends of Air quality for effective regulation. Air pollution regulation change in time and space according to transport, dispersion, development of wind rose model to asses through the environmental impact assessment of air quality Shri Shivaji Science College Amravati. Base on meteorological aspectsin present study of Environmental Impact Assessment of air quality in Amravati. Daily meteorological parameter wind speed and temperature data for one year for four representative seasons (winter, summer, Monsoon, Post Monsoon) were studied for sampling station as Shri Shivaji Science College Amravati wind-rose model was prepared for the year 2014 and compared these with RSPM10, PM2.5, NOx and SO2. Average wind speed was 4.9km/hr. which was found lowest and act as a boost to spread of pollutants near the generation source. Cold temperature and stagnant air have a creative build-up with this substance, near ground.

Keywords: sources, air quality, wind speed, temperature, parameters of air.

1.INTRODUCTION

1.1 AIR QUALITY MODEL

Amravati district is very rapidly growing in terms of its population and number of vehicles. Industrial development IRB Talegaon Amravati Toll way Private Limited National Highway No. 6 approximately 66.73 km. pass through the near city. The heavy traffic on these highways has been significantly contributed to air pollution in the city.

Modeling is used in identifying the sources that contribute to poor air quality and ongoing project air quality changes for different "what if" scenarios: for example what would happen to the air quality if a new highway, industrial or housing development were built? In this way, modeling helps us inform us decisions on how to maintain and improve air quality.

1.2 WIND-ROSE MODEL

The wind speed, direction and intensity are graphically denoted by a diagram called wind rose diagram (guidelines NAAQMS 2003-04)

Wind -rose are mostly used in the fields such as environmental impact assessment, industrial emissions measurements, oceanography, noise impact modeling wind energy, agriculture engineering, ambient air monitoring, air quality measurements, air dispersion modeling , indoor air quality testing, and soil impact modeling (India Meteorological Department).(Lira, Taisa S et.al.2012)

The result of the environmental factor on plants increases with exposure time. The dying rates, change with injury, chlorophyll reduction, and cell size reduction and reduction of the cell size area are the parameters to watch air pollution impact on plant metabolism (LeBlanc and Rao, 1975). Impact of air pollution on completely different native plant species is one amongst the major ecological problem. The environmental condition and physicochemical properties of the waste product and their residence

(Wagh,P.V.Shukla, 2006).

Local impact of air pollution on different local plant species is one amongst of the main ecological issues. The plantation on the street side encompass Neem (AadirachtaIndica), Peepal (FicusReligiosa), Almond (Terminalia) and Banyan (FicusBenghalensis) (N.D.Wagh, 2006)

2. MATERIALS AND METHODS

Multifunctional Anemometer (HTC)

This Anemometer is small in size, light in weight and easy to handle.

Wind rose diagram is prepared using an appropriate scale to represent percentage frequencies of wind directions and represent different wind speeds.

OBSERVATION TABLE

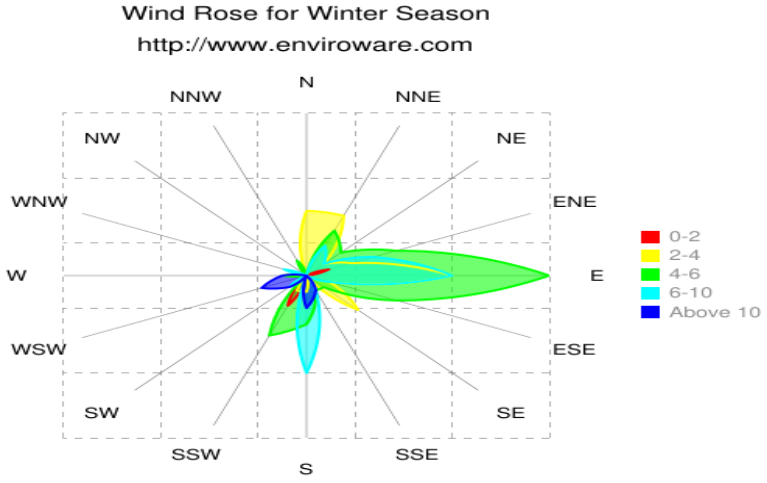
AverageWind Speed during month of the year at km/hr.

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Octo.	Nov.	Dec.
Average Wind Speed	6.61	6.78	7.67	8.33	8.71	10.33	10.90	8.96	9.72	6.77	6	4.9

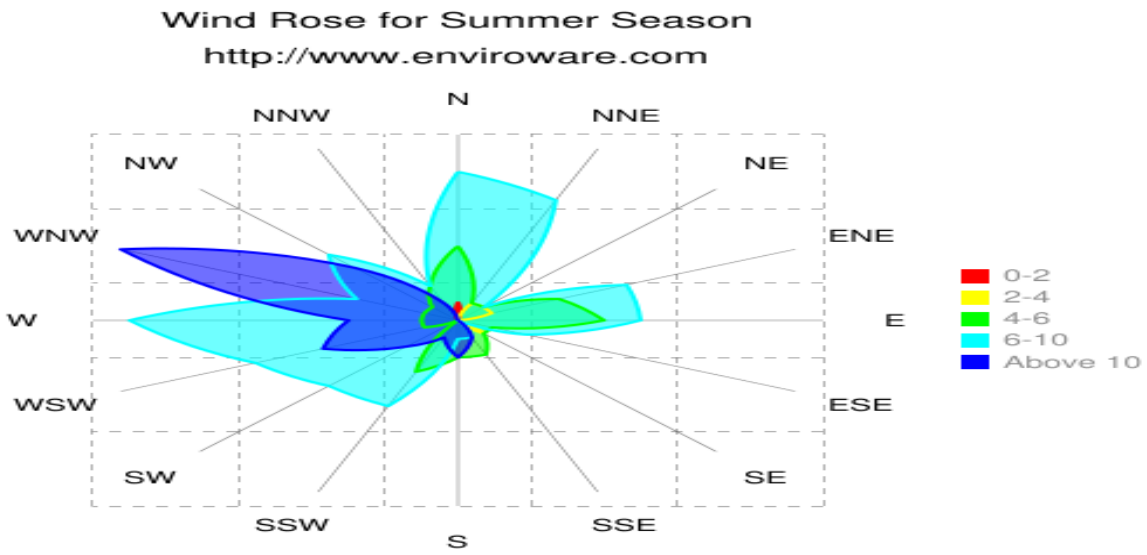
Minimum and Maximum Temperature ^{o}c of the year 2014

Month Temp.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Octo.	Nov.	Dec.
Max.	30	33	42	46	47	49	42	37	37	37	34	38
Mini.	10	9	10	20	21	23	20	22	21	16	12	7
Avg.	21	23	29	33	35	35	28	28	27	27	24	20

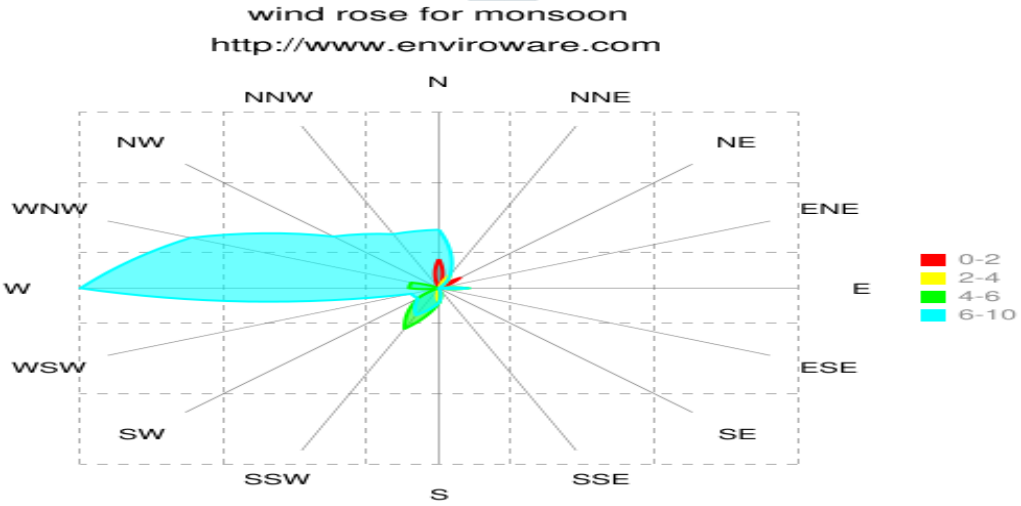
MODEL NO. 4.3.1 SHOWING WIND-ROSE MODEL FOR WINTER SEASON



MODEL NO. 4.3.2 SHOWING WIND-ROSE MODEL FOR SUMMER SEASON



MODEL NO. 4.3.3 SHOWING WIND-ROSE MODEL FOR MONSOON SEASON



3. RESULT AND DISCUSSION

In present study of Environmental Impact Assessment of air quality in Amravati. Daily meteorological parameter wind speed and temperature data for one year 2014 for four representative seasons were studied for Shri Shivaji Science College Amravati place for making wind-rose model for the year 2014 and compared these with $RSPM_{10,}$ $PM_{2.5}$,NOx and $SO_{2.}$

Observation from the Wind Rose Model during Winter Season 2014 (Model No. 4.3.1)

As per the observation. When compared with the prevailing weather condition the maximum and minimum temperature was 38°cand 7°cand average wind speedwas 4.9km/hr. Cold temperature and stagnant air have a creative build-up with this substance, near ground. These factors are also responsible for the increasing asthmatic level of Asthma patients in the area. From the wind rose diagram it can be stated that the maximum flow was in the speed of 4-6 km/hr in east direction during winter season.

Observation from the Wind Rose Model during Summer Season (Model No. 4.3.2)

The observation. When these were compared with the prevailing climatic conditions the average temperature was 33°cin April and 35 ^{0}c in Mayand average wind speedwas 8.33km/hr in April and 8.71km/hr in May which was higher than the winter season and warm air near the ground, air can easily carry away the pollutants in temperature inversion. Cold air is trapped near the ground by a layer of warm. Warm air acts like a lid, holding this pollutant down. wind rose model it can be stated that the maximum wind flow was in the speed of above 10km/hr in west- north-west direction during summer season

Observation from the Wind Rose Model during Monsoon Season 2014(Model No. 4.3.3)

A wind-rose model is developed and used to focus the distribution of pollutant according to wind speed. The model is specified 16 directions with respect to analyzed data of $RSPM_{10}$, $RSPM_{2.5}$, NO_X and SO_X for all the season.

4.CONCLUSION

From the wind-rose model observation it can be concluded that Winter Season 2014 had maximum $RSPM_{10}$value that is 139µg/m3 in December at Rajkamal Area Average wind speed of 4.9km/hr.

Furthermore at it observed that $RSPM_{10}$ and $PM_{2.5}$ maximum value are recorded 157 µg/m3 and 65 µg/m^3 in April and May for Rajkamal Square, the maximum value for NOx and SO2, 38 µg/m^3 and 32 µg/m^3 in May for MIDC, Amravati. And average wind speed is 8.33km/hr in April and 8.71km/hr in May during summer season 2014.

In 2014 Monsoon the $RSPM_{10}$ and $PM_{2.5}$ maximum value are recorded 134 µg/m^3 and 58 µg/m^3 in August for Rajkamal area and MIDC,Amravati , and average wind speed is 8.96km/hr in August and 9.72 km/hr in September.

During Post Monsoon Period $RSPM_{10}$ and $PM_{2.5}$ maximum value are recorded as150 µg/m3 and 62 µg/m^3 in October for Rajkamal Square, and NOx maximum concentration were recorded 38 µg/m^3 in November for MIDC, Amravati and SO_2 (38 µg/m^3) in October for Rajkamal Area, at average wind speed is 6.77km/hr in October.

The influence of temperature on SO_2 and NOx is much more effective in summer than in other seasons, due to higher temperature range. But during non rainy days of monsoon period, the atmospheric temperature will increase and the concentration of particulate could be on

higher side, due to the failure of natural scrubbing process. In summer clearly, indicates that the increase of temperature could accelerate the concentration of particulates in the ambient air.

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