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AMBIENT AIR QUALITY OF DAMOH (NARSINGARH) CITY FOR CEMENT INDUSTRY: A CASE STUDY

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ABSTRACT: Cement industry is a potential anthropogenic source of air pollution. It is a major contributor to dust, nitrogen oxides (NOx), sulfur oxides (SOx), and carbon monoxide (CO) in metropolitan areas. Furthermore, it contributes about 5% of the global CO_2, the famous green house gas. In cement industries, dust is emitted from *stock piles, quarrying, and transportation of raw materials, kilns operation, clinker cooling and milling*. Oxides of carbon, nitrogen, and sulfur are mainly produced as a byproduct of fuel combustion for power generation. Urban air quality is a matter of concern because of exposure of large number of people to it.
This paper assesses the ambient air quality status Damoh (narsingarh) city. One site under residential area, one industrial and one commercial area we selected purposively to spotlight an overview of the total air quality of this region. Damoh is an industrial city with its supremacy in cement manufacturing. The air quality was assessed based on measuring four air pollutants namely suspended particulate matter (SPM), Respirable Suspended Particulate Matter (RSPM), Oxides of Nitrogen (NOx) and Sulphur Dioxide (SO2). The analysis of air quality in narsingarh village for 2 successive months shows increasing trends of air pollution. The average concentration of SPM and RSPM at all the locations in each year has exceeded the prescribe limit by NAAQS.Apart from this SO_2 and NO_2 levels remain under prescribed limit with minor fluctuations. The study reveals that the industrial site has been heavily polluted in all aspects.

Key words: air quality, air pollutants, average concentration, trends, spatio-temporal analysis.

INTRODUCTION

Environmental pollution is a common problem in both developed and developing countries. Air pollution is one of serious problems faced by the people globally, especially in urban areas of developing countries, which not only experiences a rapid growth of population but also industrialization which is accompanied by growing number of vehicles. Every year large quantities of toxic wastes are discharged into the environment from the ever increasing production of goods and from the burning of fossil fuels to generate the energy needed to sustain industrial and domestic activities. Sulphur dioxide, nitrogen dioxide and suspended particulate matter (SPM) are regarded as major air pollutants in India (Agarwal and Singh, 2000). Air is rendered impure by

a) Respiration of man and animals
b) Decomposition of organic matter,
c) Combustion of coal, gas, oil etc
d) Trade, traffic and manufacturing processes that give off dust, fumes vapors' and gases.

Urban air pollution is a matter of concern in today's date because of exposure of large number of people to it and their adverse effects on human and environmental health (Barman et al., 2010). In the developing countries, air quality crisis in cities is attributed to vehicular emission which contributes to 40- 80% of

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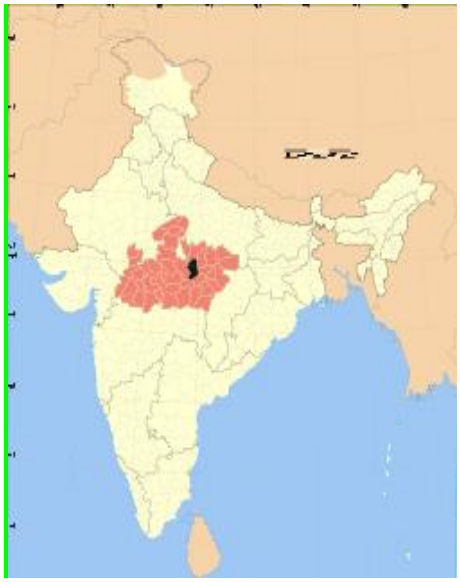
total air pollution (Ghose et al, 2005). The urban population is mainly exposed to high levels of air pollution including metals as well as fine and ultrafine particles (Nolte et al 2002) from the vehicular emission (Sharma et al, 2006). Every city has its own characteristics which becomes the pull factor for its growth and development and this developmental progress, if not checked poses risks to environment and health of the people. Damoh city is famous for its cement manufacturing industry and this unique activity of the city is responsible for the depreciated ambient air quality. Industrial operations, construction activities, poor traffic control, uneven roads and extensive automobiles exhausts are additionally helping in its quality drop. The level of SPM, RSPM, SO_2 and NO_X was measured to check the ambient air quality at different activity areas of the damoh city for two month.

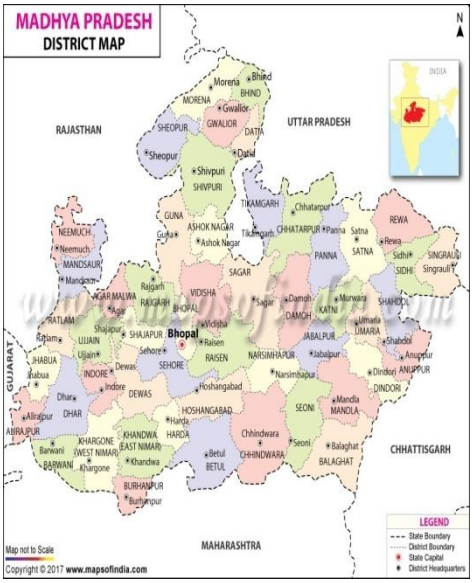
OBJECTIVES

The objectives of the present study are to assess the ambient air quality with respect to PM10, PM2.5. SO_2 and NO_X to study trends of pollutants over a period of time and space and to create public awareness about environmental pollution as well as in every industry air devices should be installed.

STUDY AREA

Damoh, the cement manufacturing city is located in western central India. Heidelberg cement India limited is a subsidiary of the Heidelberg cement group, which is one of the largest cement manufacturing in the world .the company, has a cement plant at Damoh in M.P. Its cement is sold under brand name of Mycem. Narsingarh is a small village between the banks of two rivers - Kopra and Sonar. It is about 20 kms. Away from Damoh on the Damoh-Chhatarpur State Highway No.37. The present population of the village is around 7000 and the main occupation of the local population is agriculture. Its climate is tropical and it receives moderate rains.





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MAP OF STUDY AREA

Air quality of the city is the result of its unique characteristics of glass bangle industries and the increasing vehicular traffic of the city itself as well as the heavy traffic load on national highway no. 2 which passes through the city midway. These entire combine factors expels out lots of air pollutants into the cities atmosphere posing sever problems on the health of the people as well as deteriorating the fragile ecosystem.

DATABASE AND METHODOLOGY

For the present study two month data from 28 June to 28 July have been taken into a consideration which has been obtained from Heidelberg cement plant damoh. Three stations mentioned in the table covering area of narsingarh village were selected for ambient air quality assessment. These stations were selected on the basis of their activity i.e., residential, commercial and industrial. Respirable dust sampler APM 460 BL by Environtec (New Delhi) is used to collect sample for RSPM and SPM and thermoelectrically cooled gaseous sampling attachment APM 109 by Environed (New Delhi) is used to collect sample for NOx and SO_2, and AAS 217 are used for PM 10 and AAS127 are used for pm 2.5. These samplers are installed at the height of about 8 – 12 mt from the ground level and placed on the roof of nearby domestic houses and the houses were about 40 -50 mt away from the traffic area. The sampling was done once in a month. The air samples of 24 h were collected in three shift of 8h corresponding to day time (8 – 16 h), evening (16-24h) and night time (24-8h).

RESULT

Damoh city is famous for its making cement production. There are Prediction of impacts on air quality has been carried out by using AERMOD Regulatory Model which is based on the famous Gaussian Plume Dispersion. AERMOD is developed by The U.S. Environmental Protection Agency (EPA), in conjunction with the American Meteorological Society (AMS) (EPA-454/R-03-004). The area where the

cement project is proposed has a generally flat terrain with no nearby communities, which is located twenty kilometer to the West (upwind) of the proposed project site. The impact of the project on the gaseous air pollutants including carbon monoxide, sulfur dioxide, nitrogen dioxide were estimated (Table 1-2).Based on the results, it is clear that gaseous pollutants are well below the NAAQM Standards for ambient air quality.

Monitoring Locations

Four monitoring locations representing different activities areas. These four station air sited at the premises of the clinkerisation unit of diamond cement plant and setup a/c to guidance of CPCB.I have selected four monitoring stations in unit for ambient monitoring. I.e. one in residential area (worker colony), one in near hospital, one is STP area, and one is gate of mine

S.N	CLINKERISATION UNIT DAMOH NAME
1.	Near hospital or behind building
2.	Near gate of mine pit no-1
3.	Near railway siding are
4.	Near worker colony

Trends of Ambient Air Quality in narsingarh village

The observed PM2.5, SO2 and NOX for the last two month and PM10 for last two month have been compared to find out the prevailing trend of air pollution in narsingarh village.

Respirable Suspended Particulate Matter (RSPM)

There has been an increasing trend seen in the industrial areas as well as in the residential, commercial compared to the previous year with minor fluctuations. While industrial area showed the highest increase in values over the last year. By using equipments and devices installation all the parameter are lower than the NAAQS (Table – 2 & 3)

Sulphur Dioxide (SO_2)

In residential area, lower concentration was found compared to the previous area but lower found than the other years. Commercial as well as the industrial area too showed the lower polluted with respect to the previous years. Thus at all the locations SO_2 showed a decreasing trend over the time with minor fluctuations. All the values were found to be lower minor as the city comes under the NAAQS (20 µg/m3) ecologically sensitive area (Table -2&3).

Oxides of Nitrogen (NO_2)

All the locations showed increasing trend when compared to the previous year data. Concentrations of NO_X showed the highest value at industrial site followed by the commercial area. All the values of the present study is lower than the NAAQS (Table-2& 3).

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Month-june 2017

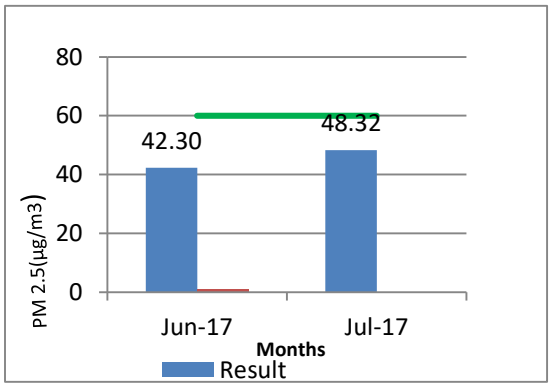
AAQMS	PM10	PM2.5	SO_2	NO_X
Near hospital	75.23	42.30	8.67	12.93
Near of gate mine(D.G SET)	60.20	45.63	8.57	7.63
Near railway siding area	80.30	47.60	9.71	15.32
Near worker colony	56.80	41.60	6.07	8.28
Standard	100	60	80	80

Month-july 2017

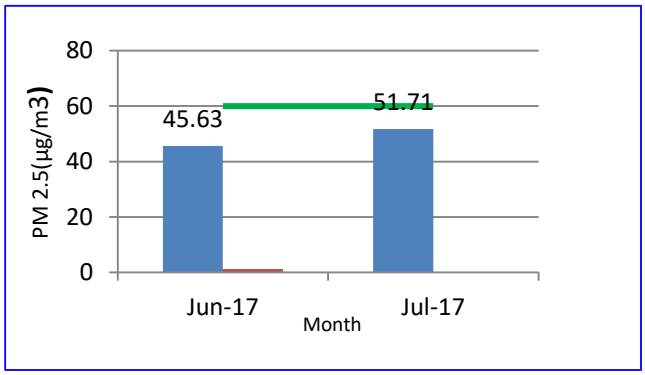
AAQMS	PM10	PM2.5	SO_2	NO_X
Near hospital	60.30	48.32	9.23	6.52
Near gate mine	55.30	51.71	7.82	8.32
Near railway siding	68.14	54.31	8.66	9.77
Near worker area	62.95	45.81	8.62	7.63

PM 2.5 GRAPH- AT DIFFERENT LOCATION

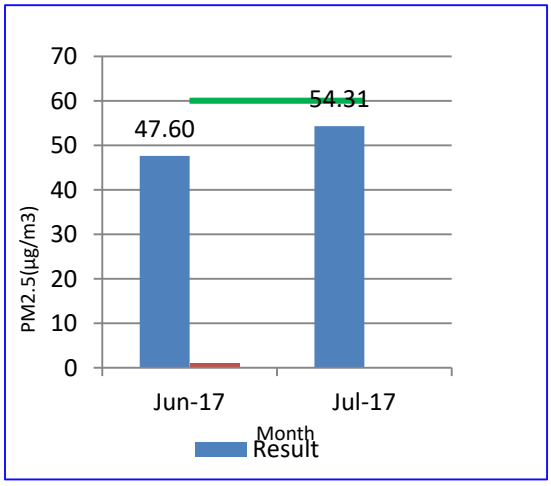
Near hospital



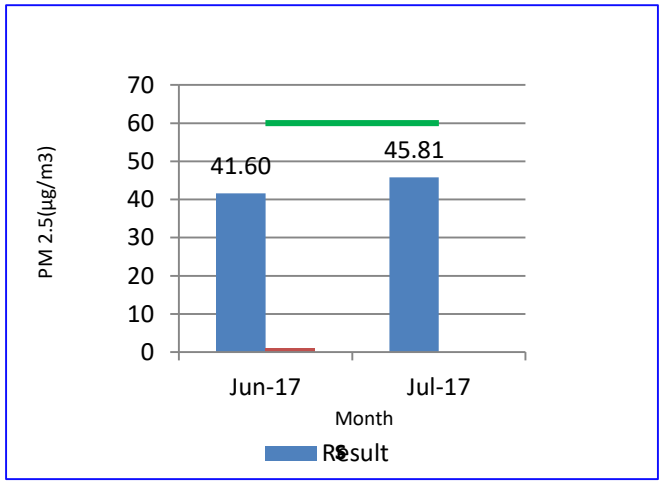
Near gate mine



Near railway siding



Near worker colony



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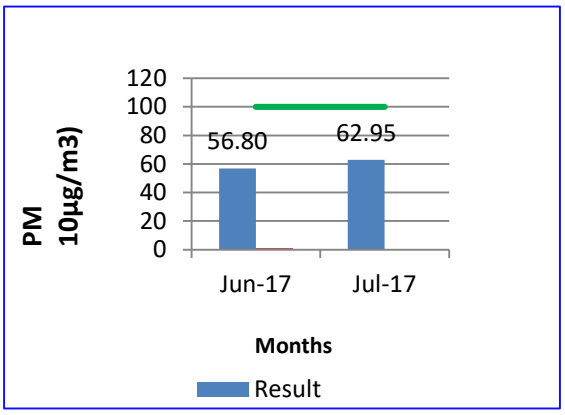
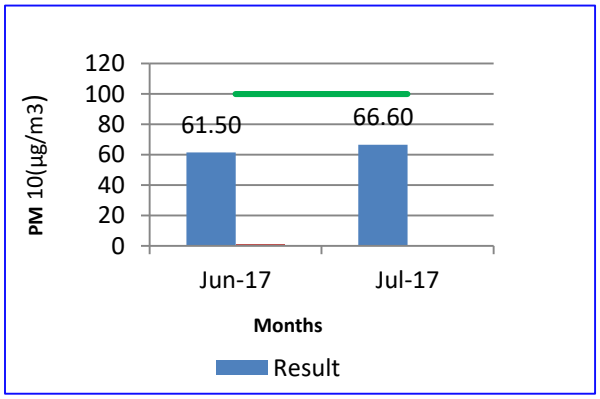
PM 10-GRAPH AT DIFFERENT LOCATION

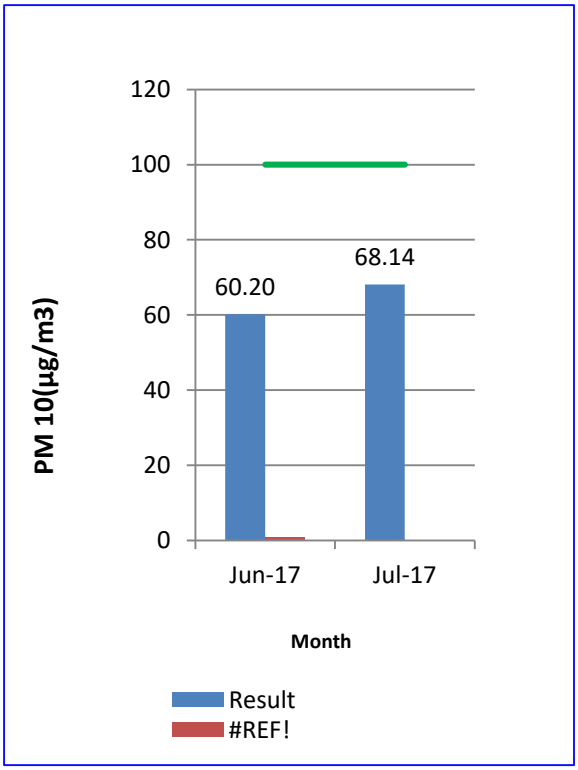
NEAR HOSPITAL



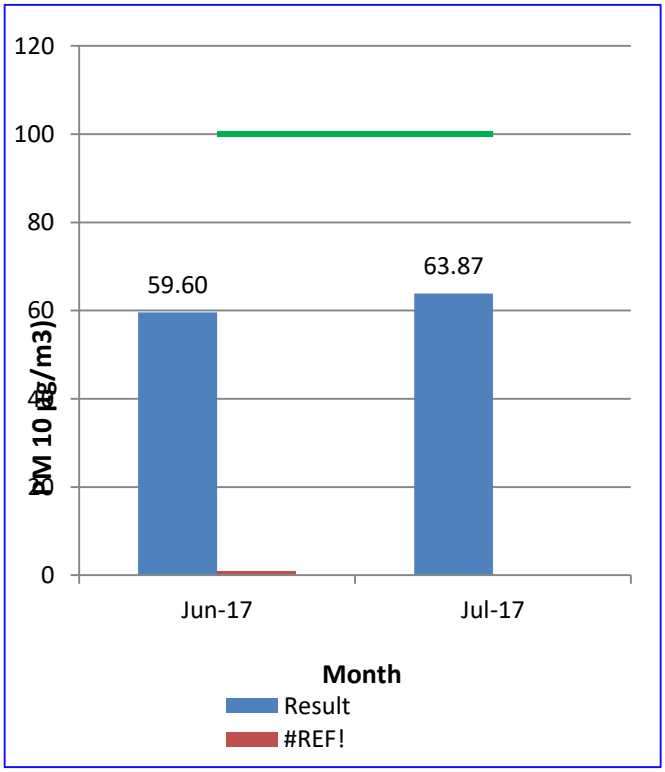
NEAR GATE MINE



NEAR RAILWAY SIDING



NEAR WORKER COLONY



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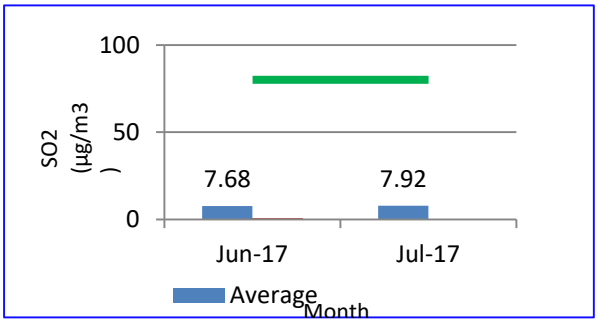
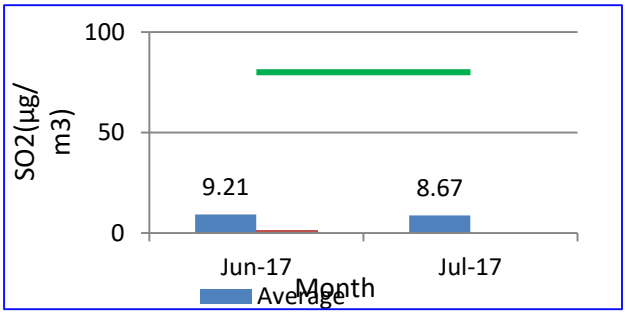
SO_2 GRAPH-AT DIFFERENT LOCATION

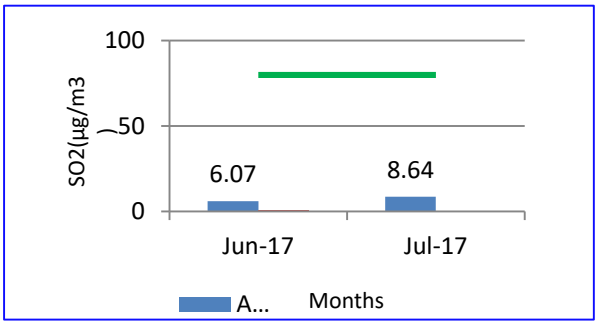
NEAR HOSPITAL



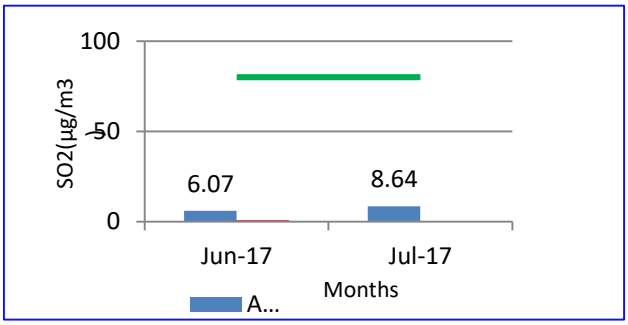
NEAR GATE MINE



NEAR RAILWAY SIDING

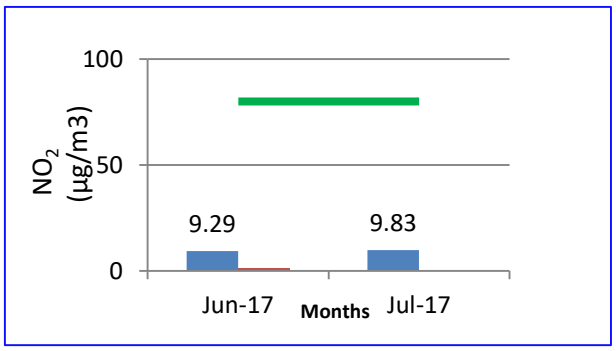


NEAR WORKER COLONY

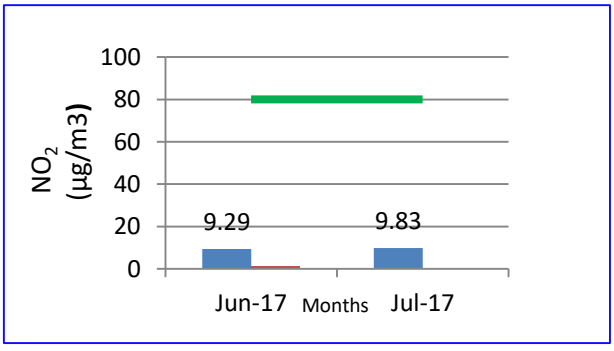


NO_2 GRAPH- AT DIFFERENT LOCATION

Near Hospital



Near Gate Mines



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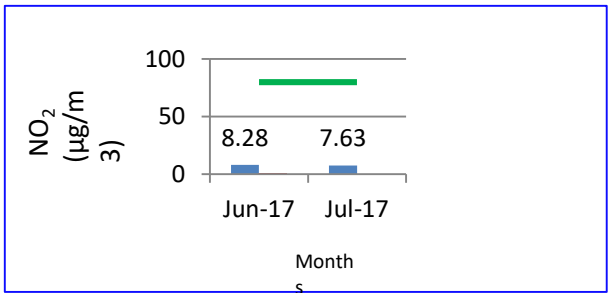
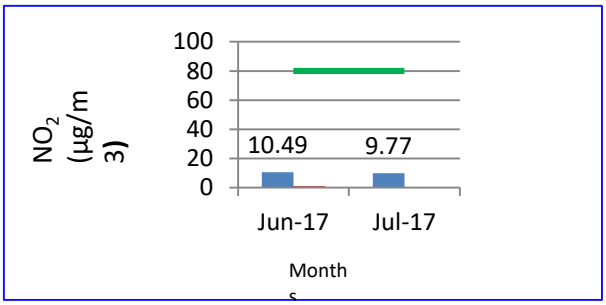
NEAR RAILWAY SIDING **NEAR WORKER COLONY**





HEALTH EFFECTS

At elevated levels, all the pollutants including metals have adverse effects on human and environmental health. Accumulation of pollutants in the human body through inhalation of air is an important route. higher level of particulate matter (PM10) at all the monitoring locations are responsible for several cardiovascular and respiratory diseases such as asthma, bronchitis, and reproductive development, increased risk of preterm birth and even mortality and morbidity rate. It is reported that the total daily mortality increased by approximately 1% for every 10 µg/m3 increase in PM10 concentration. The effect of PM depends on the mass and number concentration, shape and size and the composition and concentration of other inorganic and organic pollutants associated with it. In the present study, the concentration of NO_X was found to be below the permissible limits (80 µg/m3) while the concentration of SO_2 were found to be below permissible limit (60 µg/m3) of NAAQS. Several reports reveal that gaseous pollutants are related with respiratory diseases and reproductive and developmental effect even at low concentration. Vehicular traffic and NO_2 are associated with sign1ificantly higher risk of lung cancer.

CONCLUSIONS

In the present study analysis of air pollutants such as PM10, PM2.5, SO_2, and NOx have been done for assessment of ambient air quality of damoh (narsingarh village) City and data analysis showed the following-

The RSPM (PM10) level at all the monitoring locations of residential, commercial and industrial areas were low than the NAAQS due to its management. Fine Particles (PM2.5) level at all the monitoring locations of residential, commercial and industrial areas were much lower the NAAQS (100 µg/m3).

The concentration of gaseous pollutants, SO_2 was below the prescribed NAAQS (80 µg/m3) at all the locations while NOx was found to be above the permissible limits (80 µg/m3) and showed

increasing trend.

All parameters are in prescribed limit.

Overall results indicate that RSPM and SPM along with the gaseous pollutants are one of the major causes for deterioration of ambient air quality of the city. Unlimited growth of number of industry, vehicles, their technological development and release of invisible tailpipe pollutants emission are serious debatable issues even for the policy makers. Use of different types of fuels namely petrol, diesel, LPG and CNG make the environment more complex regarding the air quality and their synergistic effects on the human health..

The present study suggests that it is necessary to monitor the air quality as well as the health effects at regular intervals at strategic locations which will help the planners for sustainable development of the city and air pollution control equipment are also used in cement industry.

RECOMMENDATIONS

This paper presents predictions of air pollution (dust, SO_2, NOx and CO) emitted from a modern cement plant that will be constructed in the damoh city. AERMOD I Our findings indicate that after the implementation of the proposed project, concentrations of air pollutant are found to be well below the permissible Indian Standards for ambient air quality. Therefore, the proposed activity is not likely to have any significant adverse impact on the air environment in the vicinity of the proposed project. However, The TSP concentration is expected to be high at the limestone quarry, which provides the factory with its main raw material, because it generates lots of dust as a result of rocks mining and crushing.
As well as Subsidized public mass transport must be introduced/strengthened to minimize use of personal vehicles. Improvement in the traffic management. Encroachment should be removed for the smooth flow of traffic. Public awareness program for reduction of automobile pollution. Pressure horns to be removed from all vehicles and avoid use of horn. Restore foot path for pedestrian in all the industry.

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