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Initial Environment Examination of Air Quality: A Case Study of Haliyapur-Kurebhar Project Road, Uttar Pradesh.

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ABSTRACT

The present study deals with Initial Environment Examination (IEE) of Air Quality Results along Project Road of Haliyapur-Kurebhar of state of Uttar Pradesh. It is a process of evaluating the likely environmental impacts of a proposed project or development to lesser extent, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. IEE can also be defined as a tool used to identify the social economic and environmental impacts of a project prior to decision-making. Its main aim is to predict and evaluate environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers. By using IEE both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts of laws and regulations. Air pollution sources along Haliyapur to Kurebhar of Uttar Pradesh State are mainly due to vehicular traffic, Kolu (Jaggery factory) and brick kilns. The concentration of air quality parameters Particulate Matter ($PM_{2.5}$), Particulate Matter (PM_{10}), Sulphur Dioxide, Oxide of Nitrogen, Carbon Monoxide , Ozone,Ammonia, Lead, Nickel,Arsenic,Benzene, Banzo a-pyrine value exceeds the limit at all the stations while value of PM10 also exceeds the prescribed norms at all locations.

Key words: Initial Environment Examination, environmental impacts, Air pollution Haliyapur , Particulate Matter ($PM_{2.5}$), (PM_{10}), Sulphur Dioxide.

Introduction

Uttar Pradesh State located in northern India. It was created on 1937 April 1 as the United Provinces, and was renamed *Uttar Pradesh* in 1950 (IPT, 2015). Lucknow is the administrative capital of Uttar Pradesh. On 9 November 2000, the state is bordered by Rajasthan to the west, Haryana and Delhi to the northwest, Uttrakhand and the Nepal to the north, Bihar to the east, Jharkhand to the southeast, Chhattisgarh to the south and Madhya Pradesh to the southwest (VIS, 2015). It covers 93,933 square miles (243,290 km^2), equal to 6.88% of the total area of India, and is the fourth largest state with over 200 million inhabitants in 2011, it is the most populous state in the country as well as the most populous country sub division in the world. It is the Fourth largest Indian State by economy. India has the dubious distinction of leading the world in road accident fatalities (Kumar, Undated). In 2012, there were more than 138,000 people killed on the roads, implying that about 378 lives are being lost every day in India due to road accidents. Uttar Pradesh together with Tamil Nadu has been the largest contributor to the total number of road

crash deaths in the country (11.7 percent each), followed by Andhra Pradesh, Maharashtra and Rajasthan .A total of 22,155 people were injured and 16,149 killed on UP roads in 2012of which 73 percent died on national and state highways Almost 50 percent of the people killed on UP Road Network of UP (UPPWD, 2015). Air pollution is harmful to health of human being, and may well be associated with the heart, lungs death which account for 1.4% and 2% of the global total mortality rate .According to World Health Organization (WHO 2012), urban air pollution is responsible for approximately 800,000 deaths and 4.6 million lost life-years annually around the globe. Evidence from different studies has shown that respiratory and cardiopulmonary disease is strongly associated with air quality(.Chen et al., 2012,Mostofsky, et al., 2012).It has been proved that particulate matter, nitrogen dioxide (NO2), ozone (O3) and carbon monoxide (CO), and other gases in the environment can increase the morbidity and mortality rate of cardiovascular and respiratory diseases (Block, M.L., *et al.* 2012) .Air pollutants are complex mixtures which are caused by many natural and man-made reasons, including particulate matter (PM), ozone, carbon monoxide, sulfur oxides, nitrogen oxides, methane and other gases, volatile organic compounds (for example, benzene, toluene and xylene) and metals (for example, lead, manganese, vanadium, iron) (Kravchenko et al.).

Methodology

Our approach is described principally a bottom-up approach where we targeted the Haliyapur-Kurebhar community as a candidate system for analysis, illustrating what approaches are currently adopted to create, manage, use the environmental data/information that meet the aim of examining the air quality surrounded the connecting road between Haliyapur to Khurebhar in the Uttar Pradesh State of India (De Martino et al., 2011).

Materials and methods

Over the last few decades, several studies have been undertaken in various parts of the world to assess the relationship between air quality and health (WHO 200, 2003).Initial Environmental Examination (IEE) study of the project area can be best done on the basis of its physical, biological and socio-economic aspects. The description of environmental settings includes the environmental characteristic of the project area. The secondary data has been collected and primary data has been generated to establish a baseline profile related to topography, hydrology, geology, air quality, water quality, noise, soil, biodiversity, socio- economic aspects etc. Efforts have been made to collect the latest information both at regional as well as local level especially along the project road alignment. This will help to predict likely changes in the environment due to the proposed project activities. The existing baseline. Project aims to improve transport efficiency of the state road network, which will contribute to expansion of economic opportunities and poverty reduction. This will be realized by Improving the state road network, Enhanced Safety and level of Service for the road user, Superior Operation and Maintenance enabling enhanced operational efficiency of Project Roads, Facilitating safe and appropriate road usage, Increasing efficiency of transport services including saving in travel time & cost, Enhancing UPPWD'S capacity for road asset development and management.

Study area

Air quality of the roads of Haliyapur-Kurebhar project road has been assessed based on observation as well as monitoring. Different

studies was carried out on air pollution and its impacts by Anderson, et.al., 1996, Dockery et .al.,1998, Pope III et al., 1995, HEI International Oversight Committee (2004),In the present study samples were collected from two different stations. Observation includes identifying different pollution sources, presence of dust in the air etc. monitoring and collection of samples, APM-460NL (Envirotech) Respirable Dust Samplers (RDS) with provision for gaseous sampling attachment APM-860 (Envirotech) were used for measuring the concentrations of PM10, NO2 and SO2 in the ambient air while Carbon Monoxide was measured using CO Analyzer. The APM-460 NL Respirable Dust Sampler has been provided with a cyclone. The cyclone has been designed to provide separation of PM10 particles. Atmospheric air was drawn for ~24 hours through the cyclone and 20 x 25 cm glass fiber filter (GF/A) sheet at a flow rate of 0.8 to 1.2 m^3/min and finally the average flow rate was calculated. Air with suspended particulate enters the cyclone; coarse non-respirable dust is separated from the air stream by centrifugal forces. The suspended particulate matter falls through the cyclone's conical hopper and gets collected in the cyclonic-cup. The fine dust comprising the respirable fraction passes through the cyclone and gets collected on GFF. The amount of Respirable particulate per unit volume of air passed was calculated on the basis of the difference between initial and final weights of the filter paper, and the total volume of the air drawn during sampling. For gaseous (SO_2 and NO_2) sampling the impingers having absorbing reagents was exposed for ~24 hour at an impingement rate of 0.5 lpm. SO_2 was analyzed by the West-Gaeke method on Spectrophotometer at wavelength of 560 nm. NO_2 was analyzed employing the Jacob-Hochheiser modified method on spectrophotometer at wavelength of 540 nm. APM 550 Fine Particulate Sampler (Ecotech made) was used for measuring PM2.5. Fine particulates were collected on PTFE filter base, and then PM2.5 is estimated by gravimetric method.

Results and discussion

Air pollution sources along Haliyapur to Kurebhar are mainly vehicular traffic, Kolu (Jaggery factory) and brick kilns. Two ambient air monitoring stations were set up at Akhand Nagar at km 92.100, Kurebhar at km 34.400, for assessing the air quality along the project corridor. The 98th percentile concentration of the parameters assessed is provided in TableI. In the present study investigations different parameters were analyzed those are in the ranges of Particulate Matter (PM2.5)- 93.86, 84.68 µg/m3 , Particulate Matter (PM10) 152.75, 165.14 µg/m3 , Sulphur Dioxide 14.76, 18.01 µg/m3 , Oxide of Nitrogen 38.14, 35.84 µg/m3 , Carbon Monoxide 1.0, 1.1 mg/m3 , Ozone7.85, 5.89 mg/m3, Ammonia12.86, 10.18 mg/m3 , Lead0.23, 0.11 mg/m3, Nickel 0.11, 0.10 mg/m3, Arsenic 0.07,0.04 mg/m3, Benzene0.3,0.12 mg/m3, Banzo a-pyrine <0.1,< 0.1 mg/m3

Conclusion

It is observed that the concentration of gaseous pollutants like SOx, NOx and CO is well within the permissible limit of NAAQS, 2009 at the two monitoring stations viz., Haliyapur and Kurebhar in Uttar Pradesh. But PM2.5 value exceeds the limit at both the stations while the value of PM10 also exceeds the prescribed norms at both locations. Adequate measures have to be taken at these locations for limiting further generation of dust during construction activity.

Table I. Air Quality Results along Project Road of Haliyapur-Kurebhar

S No.	Parameters	Units	Haliyapur-Kurebhar NQ 1	Haliyapur-Kurebhar NQ 2	NAAQS Limits
1	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	93.86	84.68	60
2	Particulate Matter (PM_{10})	$\mu g/m^3$	152.75	165.14	100
3	Sulphur Dioxide (as SO_2)	$\mu g/m^3$	14.76	18.01	80
4	Oxide of Nitrogen (as NO_2)	$\mu g/m^3$	38.14	35.84	80
5	Carbon Monoxide (as CO)	mg/m^3	1.0	1.1	4 (1-Hr)
6	Ozone (as O_3)	$mg/m^{3`}$	7.85	5.89	100 (8-Hr)
7	Ammonia (as NH_3)	mg/m^3	12.86	10.18	400
8	Lead (as Pb)	mg/m^3	0.23	0.11	01
9	Nickel (as Ni)	mg/m^3	0.11	0.10	20
10	Arsenic (as As)	mg/m^3	0.07	0.04	06
11	Benzene (as C_6H_6)	mg/m^3	0.3	0.12	05
12	Banzo a-pyrine (BaP)	mg/m^3	< 0.1	< 0.1	01

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