

# Measurement and Analysis of the Gaseous Pollutants in the Surrounding Areas of an Upcoming Airport

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**Abstract:** Aviation affects the environment through the emission of pollutants from the aircrafts and other supporting airport infrastructure facilities, resulting on human health and the atmosphere. Emitted pollutants resulting from the aircrafts include green house gases and particulates matter that contribute to forcing of climate and gases and particulate matter that are harmful to human health. Aircraft engine emissions include CO, CO<sub>2</sub>, H<sub>2</sub>O, SO<sub>2</sub>, NO<sub>x</sub>, HC and volatile and non volatile particulate matter (PM). Navi Mumbai in the state of Maharashtra, India has been chosen as the study area. NO<sub>x</sub> and SO<sub>2</sub> concentration were monitored at 10 locations around the Navi Mumbai international airport and air quality status were evaluated at all locations. The NO<sub>x</sub> and SO<sub>2</sub> concentration were compared with the National Ambient Air Quality Standards (NAAQS) . In this paper an attempt has been made to study the NO<sub>x</sub> and SO<sub>2</sub> level concentrations in the surrounding areas of an upcoming airport..

**Key words :** Airport, PM<sub>10</sub>, NO<sub>x</sub>, SO<sub>2</sub>, secondary particles.

## I INTRODUCTION

India's economy is growing much faster as compared to many other countries in the world resulting in the growth of industries and infrastructure activities, leading to enhance emission of PM and acidic gases mainly SO<sub>2</sub> and NO<sub>x</sub>. This situation warrants a closer analysis of the impact of emission of acidic gases and PM and their interactions in atmosphere. Acidic gases are primary atmospheric pollutants contributing the formation of secondary particles (most of these are formed in fine mode) in the atmosphere leading to high health risk to population. For preparing air effective pollution control strategies, knowledge of formation of secondary particles and identifying their contribution to PM<sub>10</sub>, and more importantly, identifying the precursor gaseous pollutants responsible for formation of secondary particles are important. Control of the secondary particles will require control of identified primary precursor gaseous pollutants.

Air pollution is one of the major causes of concern for deterioration of environmental conditions, particularly in developing countries. Air borne particles in the atmosphere have serious environmental impacts on climate (Broecker,2000; Prospero *et al.*, 2002) biogeochemical cycling in ecosystems (Nriagu, 1988) outside visibility and the health of living beings (Dockery *et al.*, 1993). The problem of air pollution is a global concern in developing countries, like India and is growing due to continued population pressure and industrial growth( Pandey, 2005). It acquires a great concern worldwide and leads to numerous studies on the chemical composition of ambient aerosols and determination of pollution sources (Mouli *et al.*, 2006). Air borne particulate is the sum of the all solid and liquid particles suspended in air. This complex includes both organic and inorganic particles with varying size, composition and origins. Characterizing PM<sub>10</sub> can also help to understand potential health effects of airborne particles(HEI,2002). The chemical characterization of airborne particulate matter (PM) has a role in understanding the adverse effects of particulate matter on human health, ecosystem and materials.

**II DESCRIPTION OF THE STUDY AREA**

The site of Navi Mumbai airport is selected near Panvel town in an area admeasuring 2347 acres of land which is situated about 45 km away from the CBD of Mumbai/Santacruz airport. The airport is planned with two runways of 3700 M with parallel taxiways designed to suit the new generation large aircraft. The other facilities include the domestic terminal, international terminal, cargo terminal, airfield lighting, city side facilities etc. The phase wise development approach has been adopted to suit the air travel demand

The study area shown in Figure 1 covers the area around the airport falling within the radius of 10 kms. The study area is further divided in two parts namely core area and fringe area. The core area covers the area within the radius of 10 km, in which all the scoped environmental parameters have been studied to understand the magnitude of impact. In the remaining area i.e. fringe area places of historical importance, aesthetics, cultural including environmentally sensitive have been studied

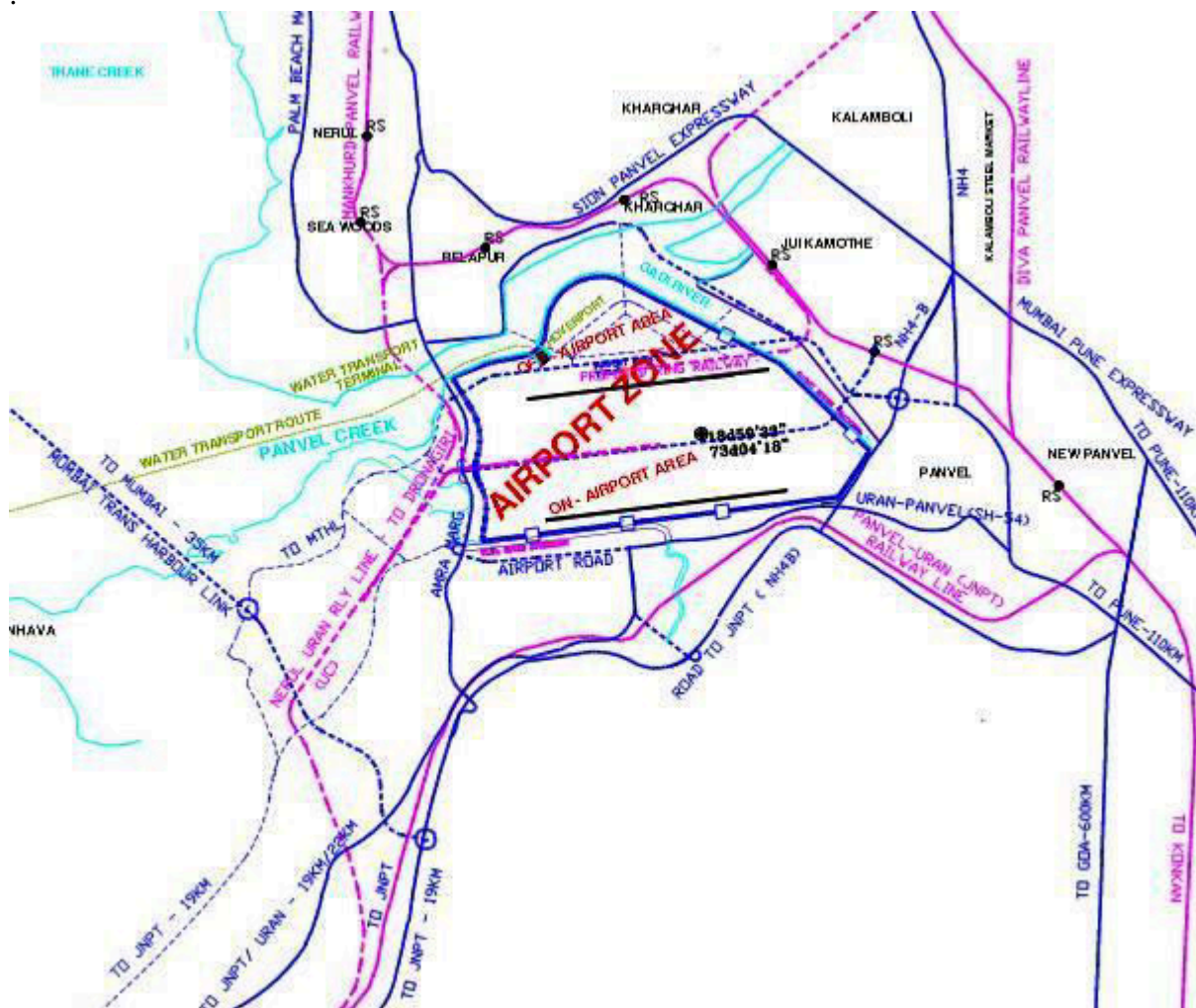


Fig 1: Location map of Navi Mumbai International Airport



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**Table 1: Location of the Air Monitoring Stations in the Project Area**

Sr.	Station Code	Station	Remarks
1.	PCO	Panvel CIDCO Office	Location of meteorological station and in residential zone
2.	KRS	Khandeshwar railway station	Commercial activity centre
3.	KCO	Kalamboli CIDCO Office	Receptor oriented as it is in residential zone
4.	KNO	Kharghar Nodal Office	Receptor oriented as it is in residential zone
5.	BCB	Belapur CIDCO Bhavan	Major commercial activity centre, heavy traffic movement
6.	PHS	Pargaon High School	Rural and mixed area
7.	GWT	Gavanphata Water Tank	Near to main Traffic Junction and hence heavy traffic movement
8.	ACL	Ambuja Cement Ltd.	Industrial activity centre
9.	KGH	Kille Gaothan Gueust House	Receptor oriented as it is in residential zone
10.	PGH	Panchsheel Guest House	Receptor oriented as it is in residential zone

**Table 2: Traffic growth rate for different links**

Category	Car, Taxi, Van	2/3 Wheelers	Buses	Trucks
Upto 2008	4.5	10.0	5.0	7.5
2009-2015	4.5	10.0	5.0	6.0
2015-2030	4.0	10.0	5.0	3.0

**IV RESULTS AND DISCUSSION**

In this study the mass concentration of PM<sub>10</sub> and its associated chemicals constituents along with NO<sub>2</sub> and SO<sub>2</sub> analyzed. Results obtained from the analysis were compared from the standards prescribed by CPCB and these results are given in following table 3

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**Table 3: Average values of different air pollutants concentration at various stations of the study area during winter season**

Station	PM <sub>10</sub>	NO <sub>x</sub>	SO <sub>2</sub>	CO	HC
KRS	202	21.0	4.0	0.6	2.18
BCB	269	32.0	3.4	0.8	2.30
ACL	168	29.0	3.5	0.6	2.01
GWT	411	27.0	4.7	0.6	2.11
PCO	222	24.0	3.4	0.8	2.28
KCO	259	25.5	4.2	0.7	2.16
KNO	176	27.3	4.0	0.7	2.22
PHS	170	20.4	4.5	0.6	2.04
KGH	210	26.6	3.9	0.7	2.04
PGH	199	25.6	3.7	0.7	2.44

**V CONCLUSION**

- The average concentrations of PM<sub>10</sub>, NO<sub>x</sub>, SO<sub>2</sub>, NH<sub>3</sub>, CO and HC in the study area during winter season were in the range of, 170-411 µg/ m<sup>3</sup> , 20.4-32.0 µg/ m<sup>3</sup> ,3.4-4.7 µg/ m<sup>3</sup> , 27.0-37.6 µg/ m<sup>3</sup> , 0.6-0.8 µg/ m<sup>3</sup> , 2.01-2.30 µg/ m<sup>3</sup> respectively.
- Air monitoring results of the study period showed that PM<sub>10</sub> were highest during winter season whereas concentration of PM<sub>10</sub> was observed to be decreased during pre monsoon, monsoon and post monsoon season. Winter season is the worst time for air quality, since surface atmospheric temperature drops down with an inversion condition. Little mixing or dilution of pollutants takes place at this stability condition (low mixing height) of the atmosphere and hindered pollutant dispersion during winter months. Moreover, suspended particles in the study area are natural and not chemical in nature and may not have adverse effect on human health.
- The concentrations of NOx and SO2 are well within prescribed limit of CPCB.

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**REFERENCES**

- [1].Broecker, W.S. 2000. "Abrupt climate changes Casual constraints provided by the pale climate record", Earth Sci.Rev.,Vol,51, 2000, pp.137-154.
- [2].CPCB 2001. "Central laboratory test methods", Central Pollution Control Board, Delhi..
- [3].Dockery, D., *et al.*. "An association between air pollution and mortality in 6 US cities". New England J Med., 1993, Vol.329(24), pp. 1759.
- [4].Duce R.A., G.L Hoffman and W.H. Zoller 1975. "Atmospheric trace metals at remote northern and southern hemisphere sites": Pollution or natural. Sci, 1975., Vol 18, pp:59-61
- [5].Goodrzi, F and F.E. Huggins.. "Monitoring the species of arsenic, chromium and nickel in milled coal, bottom ash and flyash from a pulverized coal fire power plant in Western Canada". J. Env. Mon, 2001, Vol. 3, pp.:1-6
- [6].HEI." Understanding the health effects of components of particulate matter mix: Progress and Next Steps", HEI perspectives: Health Effects Institute.
- [7] Lee D. S. Fahey D.W. and Faster P.M. "Aviation and global climate change in 21<sup>st</sup> century" ,Atmospheric environment, Voi. 43 (22-23),2009, pp3520-3537.