



AMBIENT AIR QUALITY SCENARIO AT PORT BLAIR, ANDAMAN ISLAND

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ABSTRACT

Rapid population growth in Andaman islands has resulted in a considerable impact on the air environment. During the last few decades, there has been growing concern and realization that development cannot be sustained without preserving the environment. In order to have a check on environmental degradation due to the indiscriminate growth in an area, it has become necessary to initially carry out environmental monitoring studies to assess the current status. Following which proper environmental management plan has to be prepared for protecting and improving the environment. Ambient air quality monitoring in terms of suspended particulates (SPM), sulphur dioxide and oxides of nitrogen was carried out at Port Blair for a consecutive two years period during January 2005 to May 2006. The study also focuses on the air pollution problem arising from the road transportation and shipping services.

INTRODUCTION

Air is a mixture of gases without which no life is possible on earth. Any degradation in the quality of air is harmful which can result in serious health problems to the community. Air quality monitoring is an essential component for assessing the nature of the environment.

The present study of air monitoring has been undertaken at Port Blair in Andaman and Nicobar (A & N) islands, which comprise of a chain of 572 islands, islets and rocks lying between 6°45' N and 13°45' N latitude and 92°12'E and 93°57'E longitude spread over a distance of 1120 km between lower Burma and upper Sumatra in the eastern section of the Bay of Bengal. These islands have a total area of about 8249 sq. km and consist of steep hills enclosing valleys clothed with dense tropical forests. The islands have a coastline of 1962 km, and coastal area supports a rich growth of mangrove vegetation and fringe coral reefs. The A & N islands consist of two districts namely Andaman and Nicobar and Port Blair is the capital of these islands. The climate of these islands is typically tropical with heavy gales, cyclone accompanied by hot and humid conditions. The annual temperature ranges from 18°C to 36°C. The average rainfall is about 3000 mm per year spread over a period from May to December.

SAMPLING LOCATIONS

- 1. Abredeen Bazaar:** The main market area of Port Blair. The historical cellular jail is 0.5 km away. As the bus stand is situated in this area the traffic density is comparatively high.
- 2. Junglighat:** The main shipping harbour of Port Blair. Traffic density is moderate.
- 3. Dairy Farm:** Near to airport, hotel complexes with shopping places nearby.

4. **Chatham:** Near to inter-island shipping harbour and vehicle ferry services. The abandoned historical Chatham saw mill is also situated here.
5. **Sadipur:** It is on hill top where Government residential quarters are situated.

MATERIALS AND METHODS

The air samples were collected for analysis of the pollutants from month of January to May for two consecutive years 2005 and 2006. The major sources of air pollution in the island was found to be road transportation and shipping activities. The parameters chosen for assessment of ambient air quality were suspended particulate matter (SPM), sulphur dioxide (SO₂) and oxides of nitrogen (NO_x). SPM and the gaseous pollutants (SO₂ and NO_x) were monitored on 24 hours basis.

Suspended Particulate Matter (SPM)

Calibrated respirable dust samplers (Envirotech Model APM 460) were used for monitoring SPM (with an average flow of 1.25 m³/min) and a tapping provided in the hopper of the same sampler was utilised for sampling of SO₂ and NO_x with proper flow controller (1.0 LPM). The dust particles having size >10 microns are being collected in the dust collector and measured gravimetrically (BIS 1973)

Sulphur Dioxide (SO₂)

Modified West & Gaeke spectrophotometric method was adopted. Air was collected in a scrubbing solution of sodium tetrachloromercurate and was allowed to react with HCHO and then with parosaniline hydrochloride. The absorbance of the product (red-violet dye) was measured using digital spectrophotometer (Elico-SL 27) at a wavelength of 560 nm (BIS 1969).

Oxides of Nitrogen (NO_x)

Jacob and Hocheiser modified method was followed. Oxides of nitrogen as nitrogen dioxide were collected by bubbling air through sodium hydroxide solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling was determined by using spectrophotometer (at 540 nm) by reacting the exposed absorbing reagent with phosphoric acid, sulfanilamide and N (1-naphthyl) ethylene diamine dihydrochloride.

RESULTS AND DISCUSSION

Various health hazards associated with air pollutants are given in Table 1. The air quality of different areas of Port Blair for the year 2005 has been tabulated in Table 2. The highest concentration of SPM has been recorded at Aberdeen Bazaar, which was 158.4 µg/m³ during May 2005. The minimum concentration of SPM was at Sadipur (72.8 µg/m³ during January 2005). The highest concentration of SO₂ has been found at Aberdeen Bazaar (6.9 µg/m³ during the month of February 2005), while the minimum at Sadipur (below the detectable limit during February and March 2005). The highest concentration of NO_x has been recorded at Aberdeen Bazaar (15.9 µg/m³ during May 2005), and the minimum at Sadipur (5.1 µg/m³ during February 2005). The air quality at Port Blair during the year 2006 is given Table 3 and shows a trend almost similar to that found in the year 2005.

At all the locations in the year 2005, mean SPM values ranged from 85.4 µg/m³ to 134.88 µg/m³, and mean SO₂ and NO_x values from 4.68 µg/m³ to 5.96 µg/m³ and 6.90 µg/m³ to 12.66 µg/m³ respectively. However, in the year 2006 the range was from 89.9 µg/m³ to 139.42 µg/m³, 4.42 µg/m³ to 6.00

Table 1: Major air pollutants and their associated health hazards (Center for Science and Environment, India 2006).

Name of pollutant	Health impacts
RSPM	Respiratory illness including chronic bronchitis and asthma; heart diseases.
SO ₂	Heart diseases; respiratory problems including pulmonary emphysema, cancer, eye burning, headache, etc.
NO ₂	Lung irritation, viral infection, airways resistance, chest tightness, etc.
SPM	Pneumoconiosis, restrictive lung diseases, asthma, cancer, etc.
Benzene	Causes immunotoxicity, carcinogenicity, asthma, anaemia, unconsciousness etc.
Ozone	Impaired lung function, chest pain, coughing, irritation of eyes and nose etc.
CO	Cause cherry lips, unconsciousness, death by asphyxiation etc.
Lead	Causes decreased haemoglobin synthesis, anaemia, damage to nervous and renal (kidney) systems etc.

Table 2: Ambient air quality status at Port Blair 2005 (January-May 2005).

Sl. No	Location	January			February			March			April			May		
		SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x
1	Aberdeen Bazaar	112.6	5.2	8.5	123.5	5.6	9.6	138.6	6.3	10.6	141.3	5.9	13.6	158.4	6.8	15.9
2	Junglighat	118.3	5.9	11.7	120.4	6.1	13.9	127.2	4.8	12.6	120.3	4.6	10.2	123.8	6.1	12.1
3	Dairy farm	104.3	4.6	12.2	128.4	6.9	12.3	131.6	5.3	11.8	138.2	6.3	13.8	142.9	5.8	13.2
4	Chatham	91.4	4.2	10.6	102.3	6.6	14.5	112.3	5.0	14.1	114.8	4.9	9.6	123.6	6.1	11.7
5	Sadipur	72.8	4.2	5.9	79.2	BDL	5.1	82.6	BDL	6.2	95.6	4.9	5.8	96.8	6.3	11.5

Unit: µg/m³, BDL = Below detection limit

Table 3: Ambient air quality status at Port Blair 2006 (January-May 2006).

Sl. No	Location	January			February			March			April			May		
		SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x
1	Aberdeen Bazaar	108.4	6.1	9.4	129.2	4.7	9.9	141.8	6.0	11.8	148.3	5.7	14.9	169.4	7.1	15.2
2	Junglighat	122.2	5.2	12.8	121.8	6.0	12.7	132.4	5.9	13.8	131.4	5.1	11.2	130.1	6.4	12.2
3	Dairy farm	109.2	5.1	11.6	131.8	6.2	12.6	138.2	5.8	11.9	130.1	6.8	14.7	142.4	6.1	14.2
4	Chatham	94.2	4.3	11.1	104.8	6.0	13.0	123.4	5.6	13.9	119.2	5.3	10.1	128.2	6.3	12.1
5	Sadipur	70.1	BDL	6.3	90.1	4.6	7.3	92.8	4.5	8.1	97.4	5.0	6.9	99.1	BDL	7.4

Unit: µg/m³, BDL = Below detection limit

µg/m³ and 7.2 µg/m³ to 13.0 µg/m³ respectively (Table 4 and Figs. 1 and 2). For comparison of values the ambient air quality standards are given in Table 5.

CONCLUSION

The ambient air quality survey carried out at Port Blair area during non-rainy seasons at Port Blair of Andaman and Nicobar islands for a the two consecutive years 2005 & 2006 reveals that:

- The area is free from air pollution and the ambient air quality parameters observed were found to be well within the standards prescribed by CPCB for residential and rural areas. There is not much variation of pollutant concentration between the years 2005 and 2006.

Table 4: Ambient air status in Port Blair in 2005-2006 (Mean values).

Location Name	January-May 2005			January –May 2006		
	SPM	SO ₂	NO _x	SPM	SO ₂	NO _x
Aberdeen Bazaar	134.88	5.96	11.64	139.42	5.92	12.24
Junglighat	122.0	5.50	12.1	127.58	5.72	12.54
Dairy farm	129.08	5.78	12.66	130.34	6.0	13.0
Chatham	108.88	5.36	12.1	113.96	5.5	12.04
Sadipur	85.4	4.68	6.9	89.9	4.42	7.2

Unit: $\mu\text{g}/\text{m}^3$

Table 5: Ambient air quality standards

Concentration in ambient air	SPM	SO ₂	NO _x
Industrial	500	120	120
Residential	200	80	30
Sensitive	100	80	30

Source: Central Pollution Control Board.

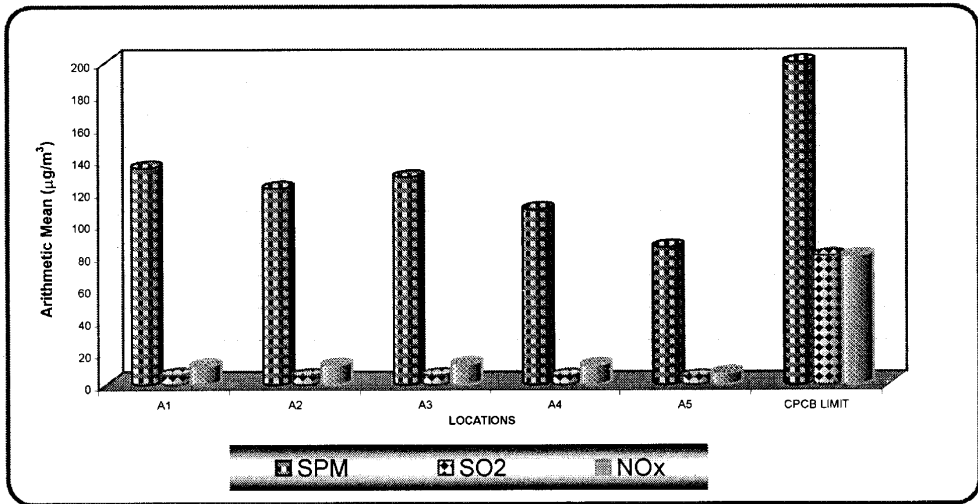


Fig. 1: Ambient air status in Port Blair in 2005 (mean values).

- The thickly green belt (natural evergreen forests) in the area prevents the dispersion of air pollutants to the surrounding areas.
- The inter-island shipping services and fishing crafts are limited and the source of air pollutants from these vessels occurs only during embarkation and disembarkation time and considered to be negligible.
- The mainland ships ply only twice or thrice in a month and the magnitude of pollution arise due to this activity is found to be insignificant. These vessels use diesel as a fuel but the emissions from these can be considered as intermittent.

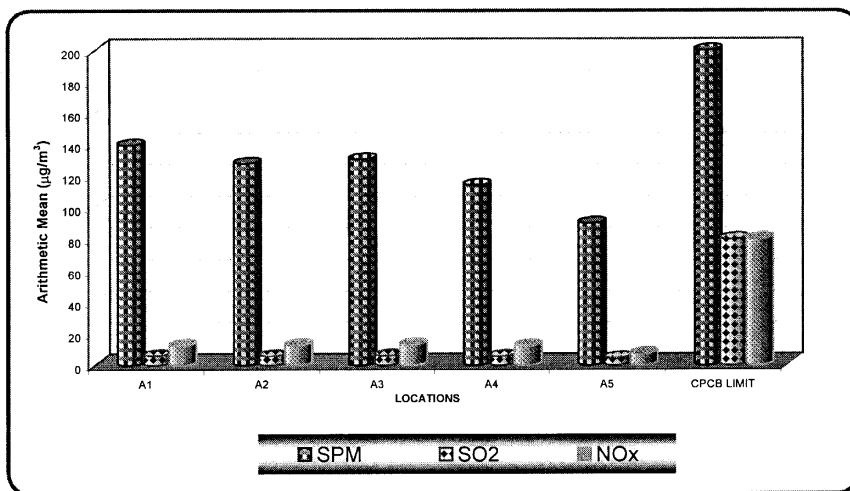


Fig. 2: Ambient air status in Port Blair in 2006 (mean values).

- As such the increased road traffic in the Port Blair is the only source of air pollution and the pollutant concentration in monitored locations is within the limit. The local Pollution Control Board conducts the periodical monitoring at regular intervals in the traffic areas to know the status in air pollution in the near future.

The maximum incremental rise over background level of NO_x and SO₂ is not more than 8 µg/m³ and it is well within the limit prescribed by CPCB. It can be concluded that the net increase over the existing background levels of air pollutants could be due to increase in crafts and vehicular traffic. The industrial activities are scattered in these islands. Most of the industries are located in south Andaman especially near Port Blair. The industrial activities are basically wood based and automobile workshops. At present no major air pollution from industrial sources are threatening in these islands. Another major source of air pollution is emissions from vehicles but it is not alarming. Ambient air quality data reveal moderate air pollution at some locations and light air pollution at others due to vehicle traffic only. The inhabitants of Andaman and Nicobar islands are fortunate to have a clean environment so far, obviously due to existence of extensive forest cover, limited population and very less industrial activity in these islands. These studies show that air pollution in these islands is well within the limits.

ACKNOWLEDGEMENT

The authors are very much thankful to Shri E. Balakrishnaiah, Environmental Engineering Laboratory/Projects and Mr. M.N Anil Kumar of M/s. Richardson & Cruddas (1972) Ltd., for their encouragement and for permission granted to publish the paper.

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