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Assessment of Ambient Air Quality and Air Quality Index of Selected Industrial Estates of West Tripura District, Tripura State, India

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Abstract

Industrialization is rapidly increasing due to the desire of nations to enhance economic status and it is associated with environmental degradation. This study has been designed to assess the ambient air quality status of Budhjungnagar industrial estate and A D Nagar, Dukli and Badharghat Industrial Cluster of Tripura West District, Tripura, The 24-hourly average concentrations of four major criteria pollutants viz. Particulate Matter PM-10, PM-2.5, Sulphur Dioxide (SO_2), and Nitrogen Dioxide (NO_2) were monitored during pre monsoon and post monsoon seasons for the year 2017 following the standard method of CPCB. The Air quality was assessed based on National Ambient Air Quality Standards of CPCB. The measured value of PM-10, PM-2.5, SO_2 and NO_2 at 5 sampling stations in and around the Budhjungnagar Industrial Estate were found in the range from 110.78 to 180.40, 76.82 to 95.32, 16.25 to 18.68 and 18.54 to 33.12 µg/m3 during pre monsoon and 86.23 to 168.53, 68.57 to 82.48, 14.22 to 18.42 and 20.14 to 32.46 µg/m3 during post monsoon respectively. The measured value of PM-10, PM-2.5, SO_2 and NO_2 at 13 sampling stations in and around the A.D. Nagar, Dukli and Badharghat Industrial Cluster areas were in the range from 94.24 to 186.60, 56.30 to 110.30, 14.82 to 20.88 and 18.54 to 32.68 µg/m3 during pre monsoon and 89.32 to 136.24, 54.22 to 89.12, 14.20 to 21.40 and 18.14 to 31.24 µg/m3 during post monsoon respectively. The outcome of the study has been presented in the form of Air Quality Index (AQI) specified by CPCB. The AQI indicated that the air quality status of the study areas ranged from 'satisfactory to 'poor' during pre monsoon and 'satisfactory to 'moderately polluted' during post monsoon season.

Introduction

Air is the most important natural resources for nourishment and existence of life. Clean air is one of the major basic requirements for good human health. It becomes polluted by variety of sources (Patel *et al*., 2017). Air pollution means the presence of chemicals or compounds in the air at the levels that pose a health risk which are not naturally occurring and which lower the quality of air, and are harmful to all living things in the atmosphere (Rajamanickam *et al*., 2018). It becomes critical throughout the world due to public health problem. It is a complex mixture of various gases, particles, aerosols, water vapour, which has been, generated only due to human activities and other natural/anthropogenic activities. The Air pollution problem becomes acute for its multiplicity and complexity of its various sources such as industries, automobiles, generator sets, domestic fuel burning, road side dusts, construction activities etc.(Harinath *et al*., 2010). The ambient air qualities have been gradually degraded in India. This is due to rapid urbanization, industrialisation, poor road conditions and maintenance of vehicles, lack of awareness (Srinivas *et al*., 2013). There are interrelation between air quality and health because air pollution results in breathing difficulties, Asthma, Cancer and even death. The deterioration of air quality is one of the main environmental concerns, which affects many urban, industrial sites and its surrounding areas. It also reduces crop yield, and destroys infrastructure and patrimony (Balashanmugam *et al*., 2015). The emission arises from vehicular movement and industrial activities are the major sources of air pollutants in the Agartala i.e. the State capital of Tripura. The roadside dust and other constructional activities are being also contributed to air pollution. Therefore, it is need to assess the ambient air quality status of Agartala especially in and around Industrial areas of West Tripura District.

Study Area

The present study areas considered here are Budhjungnagar Industrial Estate, A.D. Nagar, Dukli and Badharghat Industrial Cluster, which are located in the Tripura West District, Tripura, India. The study areas lie between latitude $23^0$16' - $24^0$14' north and longitude $91^0$09' - $91^0$47' east. The Budhjungnagar Industrial Estate, having area 535.73 acres, is located in rural area. The three other industrial areas A.D. Nagar (8.41 acre), Dukli (45.77 acre) and Badharghat (20.525 acre) considered together as industrial cluster are located in urban area and the distance between these industrial areas are very less (TIDC). There are mainly rubber based unit, thermal power plants, Steel rolling plant, distillery, food processing, stone crusher, brick kiln, dairy, automobile, pharmaceuticals, rubber wood treatment, spices, tyre and tube, hot mix plant, latex processing, cattle feed etc. industries are found in selected industrial estate of study areas and have high air pollution potential. The NH-44 National Highway is passing adjacent to the A.D. Nagar, Dukli and Badharghat Industrial areas. The present study is focused on assessment of air quality of selected industrial areas of the study area by examining the various air pollutants during pre-monsoon and post-monsoon seasons of the year 2017.

The details of sampling locations and map are illustrated in Table 1 and 2 and Figure-1 respectively.

Table 1 Sampling Locations in and around Budhjungnagar Industrial Estate.

Location No.	Location	Type of Site	Latitude	Longitude
S-1	Kalitilla	Residential	N $23^0$52.472	E $91^0$19.778
S-2	Ramdas Kobra Para	Residential	N $23^0$52.494	E $91^0$21.987
S-3	Rabia Narayan Para	Residential	N $23^0$53.681	E $91^0$53.681
S-4	Durgachowdhury Para	Residential	N $23^0$51.925	E $91^0$20.315
S-5	Budhjungnagar Industrial Estate	Industrial	N $23^0$53.086	E $91^0$21.658

Table 2 Sampling Locations in and around A.D. Nagar, Dukli and Badharghat Industrial Cluster.

Location No.	Location	Type of Site	Latitude	Longitude
S-6	Bordowali	Commercial	N $23^0$49.070	E $91^0$16.380
S-7	AD Nagar Industrial Estate	Industrial	N $23^0$48.810	E $91^0$16.260
S-8	Sebak Sangha, MB Tilla	Residential	N $23^0$48.797	E $91^0$15.967
S-9	Netaji Palli, Near Ram Thakur College	Residential	N $23^0$47.815	E $91^0$16.121
S-10	Badarghat Industrial Estate	Industrial	N $23^0$47.815	E $91^0$16.121
S-11	Tribeni Sangha, Beltali	Residential	N $23^0$48.507	E $91^0$15.605
S-12	Chowrangi Para	Residential	N $23^0$48.330	E $91^0$15.413
S-13	Kanchan Palli, South Badarghat	Residential	N $23^0$47.291	E $91^0$16.590
S-14	Dukli Industrial Estate	Industrial	N $23^0$46.900	E $91^0$17.506
S-15	Baishnab Tilla, Amtali , Dukli	Residential	N $23^0$47.021	E $91^0$16.316
S-16	Ranirkhamar, Dukli	Residential	N $23^0$46.809	E $91^0$17.836
S-17	Indira Colony, Dukli	Residential	N $23^0$46.756	E $91^0$17.444
S-18	Das Para, Kathaltali,Dukli	Residential	N $23^0$47.179’	E $91^0$17.218

Method and Metarials

To assess the impact of industrial activities on air quality, the air quality monitoring have been conducted in 5 (five) locations in and around Budhjungnagar Industrial Estate and 13 (thirteen) locations in and around the cluster of three Industrial Estates (A.D. Nagar Industrial Estate, Badharghat Industrial Estate and Dukli Industrial Estate) during March - May 2017 (pre-monsoon) and October–December, 2017 (post-monsoon). The coordinates at selected monitoring stations were collected using GPS (Garmin Model-etrex 10). The Monitoring of ambient air quality parameters such as Particulate Matter (PM-10 and PM-2.5), SO_2 and NO_2 were carried out using Respirable Dust Sampler (Envirotech APM 460 BL) having thermoelectrically cooled gaseous attachment (APM 411 TE) containing impingers and Fine Particulate Sampler

(Envirotech APM 550 MFC) at an average flow rate of 1.0-1.5 m^3/min. The Samplers have been fixed at a breathing height of 1.5 m above the ground level and flow rate were noted after 5 minutes of starting of the sampling. The Particulate Matter were measured gravimetrically. The gaseous pollutants like SO_2 and NO_2 were collected by bubbling the sample in specific absorbing (Sodium terachloromercurate for SO_2 and Sodium Hydroxide for NO_2) solution kept in impinger putting in ice boxes. The concentration of NO_2 and SO_2 were determined spectrophotometrically (Thermofisher V-Visible Spectrophotometer) using standard modified method of Jacobs- Hocheiser and West – Gaeke respectively. All the reagents were used of AR grade and the glassware were of standard quality (CPCB, 2013, Panda *et al*.2012, Panigrahi *et al*., 2013 and Srinivas *et al*., 2013).

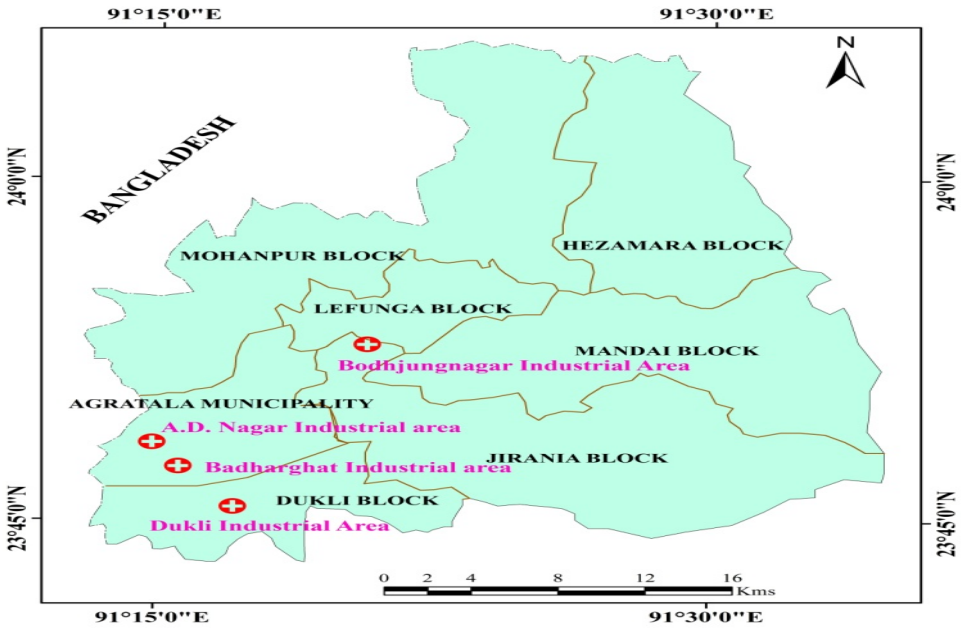

Figure 1 Map showing the selected four industrial areas in West Tripura District, Tripura, India.

An Air Quality Index (AQI) is defined as an overall system that transforms the weighed values of individual air pollution related parameters (for example, pollutant concentrations) into a single number or set of numbers. AQI is a tool for effective dissemination of information regarding air quality status to the common people. The breakpoint concentration based AQI is more effective and can be used for decision making as reported in CPCB, 2014 (CPCB, 2014). AQI is reflecting the collective effect of all the measured pollutant to interpret the overall air quality status in a particular study area very nicely (Nigam *et al*., 2015). The National Ambient Air Quality Standard of CPCB have been used for calculating air quality index (CPCB, 2009). In this present

study, the AQI were calculated using IND-AQI specified by CPCB. The index has been developed based on the dose-response relationship of various pollutants. This IND-AQI has 6 categories and mentioned in Table 3.

Table 3 Various Categories of IND-AQI (National Air Quality Index, CPCB, October 2014)

AQI Category	Range	Associated Health Impacts
Good	0–50	Minimal Impact
Satisfactory	51–100	May cause minor breathing discomfort to sensitive people.
Moderately polluted	101–200	May cause breathing discomfort to people with lung disease such as asthma, and discomfort to people with heart disease, children and older adults.
Poor	201–300	May cause breathing discomfort to people on prolonged exposure, and discomfort to people with heart disease
Very Poor	301–400	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases.
Severe	401-500	May cause respiratory impact even on healthy people, and serious health impacts on people with lung/heart disease. The health impacts may be experienced even during light physical activity.

The AQI method involves formation of sub indices for each pollutant and aggregation of sub-indices. It has been developed on the dose-response relationship of various pollutants (Sarella *et al*., 2015). The table 4 shows the Linear segmented relationship for sub-index values and the corresponding pollutant concentrations that are calibrated to Indian conditions.

Table 4 Break Points of Various Pollutants **(**National Air Quality Index, CPCB, October 2014) (Units: µg/m3)

AQI Category Range	PM-10 (24hr)	PM-2.5 (24hr)	SO_2 (24hr)	NO_2 (24hr)
Good (0-50)	00-50	0-30	0-40	0-40
Satisfactory (51– 100)	51-100	31-60	41-80	41-80
Moderately Polluted (101–200)	101-250	61-90	81-380	81-180
Poor (201-300)	251-350	91-120	381-800	181-280
Very Poor (301-400)	351- 430	121-250	801-1600	281-400
Severe (401-500)	>430	>250	>1600	>400

The mathematical equations for calculating sub-indices is as follows

$$I_p = \left(\frac{I_{HI} - I_{LO}}{B_{PHI} - B_{PLO}} \; x \; (C_p - B_{PLO})\right) + I_{LO}$$

- Where I_P is AQI for pollutant "P" (Rounded to the nearest integer),

- C_P the actual ambient concentration of pollutant "P",
- B_{PHI} the upper end breakpoint concentration that is greater than or equal to CP,
- B_{PLO} the lower end breakpoint concentration that is less than or equal to CP,
- I_{LO} the sub index or AQI value corresponding to B_{PLO},
- I_{HI} the sub index or AQI value corresponding to B_{PHI}.

Result and Discussion

The measured air quality data obtained from monitoring of ambient air at various locations of the study areas have been used to calculate the air quality index for critical parameter. The AQI were calculated for pre monsoon and post monsoon season. The AQI were calculated based on Break Point concentration for 24 hourly average concentrations for air pollutant like PM-10, PM-2.5, SO_2 and NO_2. The ambient air quality data are given in the Tables 5 and 6.

Table 5 Air Quality Monitoring Data at Budhjungnagar Industrial Areas.

Location No.	Locations	Particulate Matter 10 (µgm/m^3)		Particulate Matter 2.5 (µgm/m^3)		SO_2 (µgm/m^3)		NO_2 (µgm/m^3)	
		Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
S-1	Kalitilla	110.78	86.23	78.62	74.26	16.44	14.22	22.87	20.64
S-2	Ramdas Kobra Para	126.42	134.79	78.84	82.62	18.23	16.74	18.54	20.14
S-3	Rabia Narayan Para	134.55	120.24	87.66	74.74	16.25	16.82	24.43	24.20
S-4	Durgachowdhury Para	180.40	168.53	95.32	82.48	18.68	18.42	33.12	32.28
S-5	Budhjungnagar Industrial Estate	124.78	122.39	76.82	68.57	16.39	18.32	32.18	32.46

The measured value of PM-10, PM-2.5, SO_2 and NO_2 at the 5 sampling stations in and around the Budhjungnagar Industrial Estate were ranged from 110.78 to 180.40, 76.82 to 95.32, 16.25 to 18.68 and 18.54 to 33.18 µg/m3 during pre monsoon and 86.23 to 168.53, 68.57 to 82.48, 14.22 to 18.42 and 20.14 to 32.46 µg/m3 during post monsoon respectively. The measured value of PM-10, PM-2.5, SO_2 and NO_2 at the 13 sampling stations in and around the A.D. Nagar, Dukli and Badharghat Industrial Cluster areas were ranged from 94.24 to 186.60, 56.30 to 110.30, 14.82 to 20.88 and 18.54 to 32.68 µg/m3 during pre monsoon and 89.32 to 136.24, 54.22 to 89.12, 14.20 to 21.40 and 18.14 to 31.24 µg/m3 during post monsoon respectively.

Table 6 Air Quality Monitoring Data at A.D. Nagar, Dukli and Badharghat Industrial Cluster areas .

Location No	Locations	Particulate Matter 10 ($\mu gm/m^3$)		Particulate Matter 2.5 ($\mu gm/m^3$)		SO_2 ($\mu gm/m^3$)		NO_2 ($\mu gm/m^3$)	
		Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
S-6	Bordowali	186.60	126.23	110.30	78.62	16.54	16.44	22.87	21.64
S-7	AD Nagar Industrial Estate	120.42	112.79	82.84	74.62	16.22	16.23	18.54	18.14
S-8	Sebak Sangha, MB Tilla	134.55	120.24	89.66	72.74	15.82	15.24	20.43	19.20
S-9	Netaji Palli, Near Ram Thakur College	142.53	124.40	92.32	82.48	18.42	18.68	32.12	30.28
S-10	Badarghat Industrial Estate	120.39	112.78	68.57	64.82	16.39	16.84	28.86	28.14
S-11	Tribeni Sangha, Beltali	134.42	136.24	72.42	78.12	16.12	16.44	30.52	29.54
S-12	Chowrangi Para	110.62	126.34	82.64	89.12	18.92	18.14	32.68	31.24
S-13	Kanchan Palli, South Badarghat	104.28	92.12	64.34	54.22	16.78	15.42	30.86	30.12
S-14	Dukli Industrial Estate	96.82	92.22	59.22	57.56	14.82	14.20	29.23	28.20
S-15	Baishnab Tilla, Amtali, Dukli	94.24	89.32	56.30	58.24	16.34	16.58	18.92	18.22
S-16	Ranirkhamar, Dukli	110.92	116.56	70.88	64.30	18.32	18.20	22.70	21.62
S-17	Indira Colony, Dukli	117.86	112.74	78.68	69.20	16.52	15.68	24.56	24.10
S-18	Das Para, Kathaltali,Dukli	134.45	122.64	90.58	85.72	20.88	21.40	30.42	28.84

The PM-10 and PM-2.5 were found beyond the prescribed National Ambient Air Quality Standard limits in major sampling stations of both study areas during pre and post monsoon. The SO_2 and NO_2 level were found within the prescribed standard limit in all sampling stations during pre and post monsoon. The AQI values calculated for five sampling locations in and around the Budhjungnagar Industrial Estate area revealed that PM-10 are moderately polluted in all the sampling stations except in Kalitilla which are satisfactory during post monsoon season. The AQI values for PM-2.5 are found moderately polluted in all the sampling stations except in Durga Chowdhury Para during pre monsoon, which is poor category. The AQI values for SO_2 and NO_2 are found good in all sampling locations.

The AQI values for thirteen sampling locations in and around the A.D. Nagar, Dukli and Badharghat Industrial Cluster areas reflected that PM-10 are found Satisfactory

at Dukli Industrial Estate, Baishnab Tilla during pre and post monsoon and at Kanchan Palli during post monsoon. The AQI values for remaining sampling stations were under moderately polluted category. The AQI values for PM-2.5 are found satisfactory at Kanchan Palli during post monsoon and at Dukli Industrial Estate and Baishnab Tilla during pre monsoon and post monsoon. The AQI values for PM-2.5 are found poor category at Bordowali, Netaji Palli and Das Para during pre monsoon. The AQI values for PM-2.5 at the remaining sampling stations are under moderately polluted category.

The AQI values for SO_2 and NO_2 are found good in all sampling locations.The high value of PM-10 and PM-2.5 in both the study areas may be due to industrial activities, constructional activities such as building and flyover, wind-blown dust from roads and traffic movement of National Highway. (Harinath *et al*., 2010 and Akinfolarin *et al*., 2017) It is also observed that the seasonal variation of AQI in both the study areas are is decreasing trend. This trend may be due to precipitation in rainy season. The precipitation helps in wet settlement of air pollutants (Bishoi *et al*., 2009 and Basha *et al*., 2014). The AQI for the eighteen stations are given in the Tables 7 and 8. The seasonal variation of overall AQI in the study areas during pre and post monsoon are given in Figure-2. The Overall AQI during Pre Monsoon and Post Monsoon in AD Nagar, Badharghat, Dukli and Budhjungnagar Industrial Estate are shown in Figure-3.

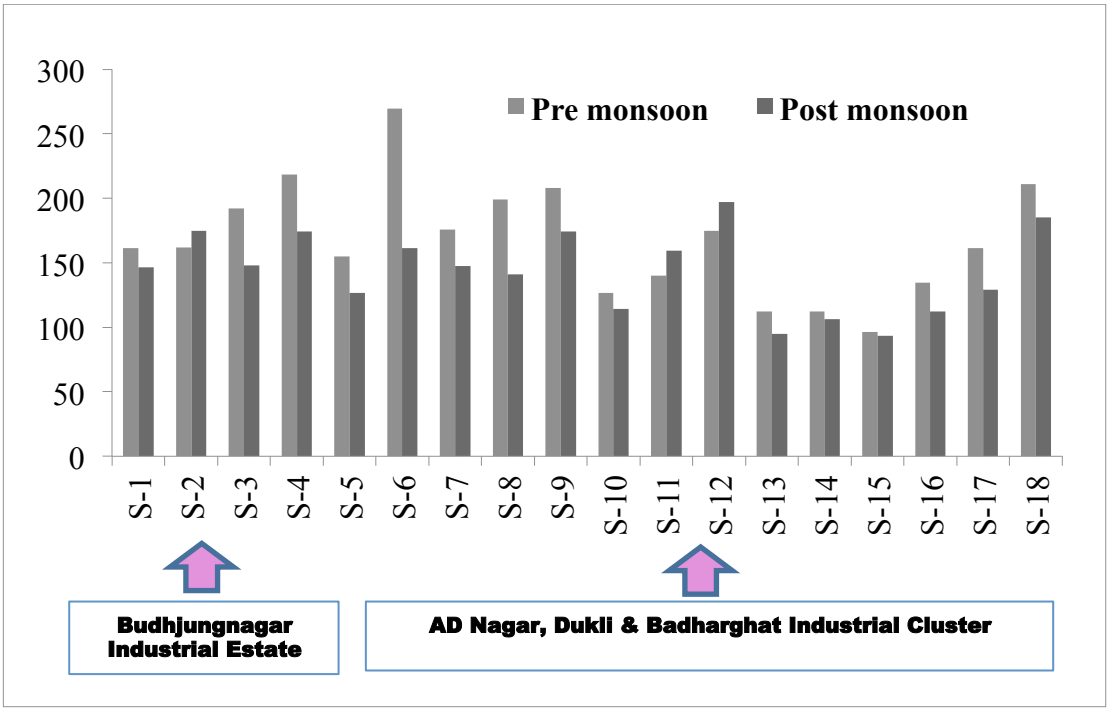

Figure-2 Graphical Representation of AQI in and around Budhjungnagar Industrial Estate and AD Nagar, Dukli and Badharghat Industrial Cluster during Pre-Monsoon and Post-Monsoon Seasons

Table-7 AQI Value for individual parameters at Budhjungnagar Industrial Estate and A.D. Nagar, Dukli and Badharghat Industrial Cluster areas.

Location No	Locations	AQI							
		PM-10		PM-2.5		SO_2		NO_2	
		Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon	Pre Monsoon	Post Monsoon
Budhjungnagar Industrial Estate area									
S-1	Kalitilla	107.49	91.18	161.15	146.26	20.55	17.77	28.58	25.80
S-2	Ramdas Kobra Para	117.88	123.45	161.90	174.80	22.78	20.92	23.17	25.17
S-3	Rabia Narayan Para	123.29	113.78	192.01	147.90	20.31	21.02	30.53	30.25
S-4	Durgachowdhury Para	153.75	145.86	218.16	174.32	23.35	23.02	41.40	40.35
S-5	Budhjungnagar Industrial Estate	116.80	115.21	155.00	126.84	20.48	22.90	40.22	40.57
A.D. Nagar, Dukli and Badharghat Industrial Cluster areas									
S-6	Bordowali	157.87	117.76	269.30	161.15	20.67	20.55	28.58	27.05
S-7	AD Nagar Industrial Estate	113.90	108.83	175.55	147.49	20.27	20.28	23.17	22.67
S-8	Sebak Sangha, MB Tilla	123.29	113.78	192.01	141.07	19.77	19.05	25.53	24.00
S-9	Netaji Palli, Near Ram Thakur College	128.59	116.54	207.92	174.32	23.02	23.35	40.15	37.85
S-10	Badarghat Industrial Estate	113.88	108.82	126.84	114.04	20.48	21.05	36.07	35.17
S-11	Tribeni Sangha, Beltali	123.20	124.41	139.98	159.44	20.15	20.55	38.15	36.92
S-12	Chowrangi Para	107.39	117.83	174.87	196.99	23.65	22.67	40.85	39.05
S-13	Kanchan Palli, South Badarghat	103.17	95.09	112.40	77.85	20.97	19.27	38.57	37.65
S-14	Dukli Industrial Estate	98.22	95.16	94.92	89.25	18.52	17.75	36.53	35.25
S-15	Baishnab Tilla, Amtali , Dukli	96.50	93.23	84.95	91.57	20.42	20.72	23.65	22.77
S-16	Ranirkhamar, Dukli	107.9	111.33	134.72	112.26	22.90	22.75	28.37	27.02
S-17	Indira Colony, Dukli	112.20	108.80	161.35	128.99	20.65	19.60	30.70	30.12
S-18	Das Para, Kathaltali, Dukli	123.22	115.37	210.98	185.38	26.10	26.75	38.02	36.05

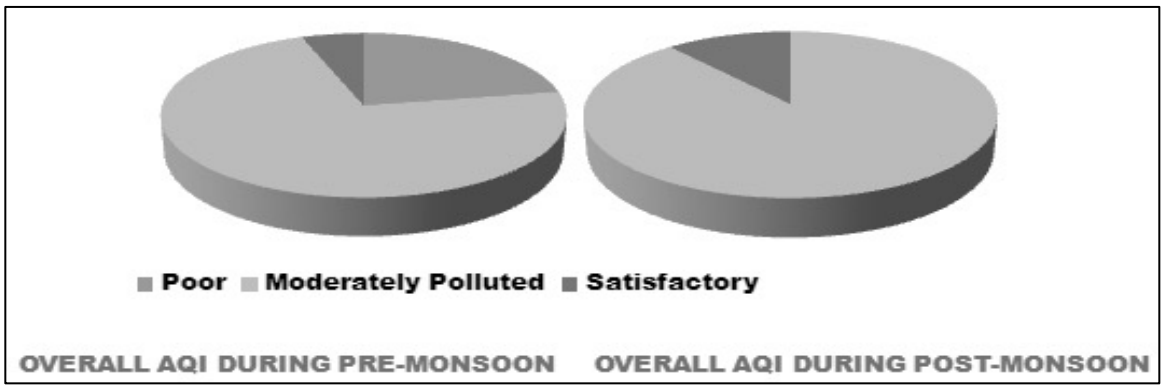

Figure 3 Overall AQI during Pre Monsoon and Post Monsoon.

Table-8 Overall AQI Value at Budhjungnagar Industrial Estate and A.D. Nagar, Dukli and Badharghat Industrial Cluster areas during pre monsoon and post monsoon

Location No	Locations	Season	Overall AQI	Results
S-1	Kalitilla	Pre monsoon	161.15	Moderately Polluted
		Post monsoon	146.26	Moderately Polluted
S-2	Ramdas Kobra Para	Pre monsoon	161.9	Moderately Polluted
		Post monsoon	174.8	Moderately Polluted
S-3	Rabia Narayan Para	Pre monsoon	192.01	Moderately Polluted
		Post monsoon	147.9	Moderately Polluted
S-4	Durgachowdhury Para	Pre monsoon	218.16	Poor
		Post monsoon	174.32	Moderately Polluted
S-5	Budhjungnagar Industrial Estate	Pre monsoon	155	Moderately Polluted
		Post monsoon	126.84	Moderately Polluted
S-6	Bordowali	Pre monsoon	269.3	Poor
		Post monsoon	161.15	Moderately Polluted
S-7	AD Nagar Industrial Estate	Pre monsoon	175.55	Moderately Polluted
		Post monsoon	147.49	Moderately Polluted
S-8	Sebak Sangha, MB Tilla	Pre monsoon	198.83	Moderately Polluted
		Post monsoon	141.07	Moderately Polluted
S-9	Netaji Palli, Near Ram Thakur College	Pre monsoon	207.92	Poor
		Post monsoon	174.32	Moderately Polluted
S-10	Badarghat Industrial Estate	Pre monsoon	126.84	Moderately Polluted
		Post monsoon	114.04	Moderately Polluted
S-11	Tribeni Sangha, Beltali	Pre monsoon	139.98	Moderately Polluted
		Post monsoon	159.44	Moderately Polluted
S-12	Chowrangi Para	Pre monsoon	174.87	Moderately Polluted
		Post monsoon	196.99	Moderately Polluted
S-13	Kanchan Palli, South Badarghat	Pre monsoon	112.4	Moderately Polluted
		Post monsoon	95.09	Satisfactory
S-14	Dukli Industrial Estate	Pre monsoon	111.99	Moderately Polluted
		Post monsoon	106.32	Moderately Polluted
S-15	Baishnab Tilla, Amtali , Dukli	Pre monsoon	96.5	Satisfactory
		Post monsoon	93.23	Satisfactory
S-16	Ranirkhamar, Dukli	Pre monsoon	134.72	Moderately Polluted
		Post monsoon	112.26	Moderately Polluted
S-17	Indira Colony, Dukli	Pre monsoon	161.35	Moderately Polluted
		Post monsoon	128.99	Moderately Polluted
S-18	Das Para, Kathaltali, Dukli	Pre monsoon	210.98	Poor
		Post monsoon	185.38	Moderately Polluted

Conclusion

The analytical data reveals that PM-10 and PM-2.5 were beyond the prescribed standard limit in major sampling locations during pre monsoon and post monsoon. The AQI study reveals that PM-10 and PM-2.5 were mainly responsible for polluting the environment at almost all sampling locations during pre monsoon and post monsoon. The gaseous pollutants namely SO_2 and NO_2 were under the permissible limits as per CPCB standard. The majority of AQI values for PM-10 and PM-2.5 parameters fall under the category of moderately polluted and very poor respectively. The overall AQI value predict that all sampling sites in and around Budhjungnagar Industrial Estate area fall under moderately polluted category during pre and post monsoon except at Durga Chowdhury Para (poor category) during pre monsoon. The overall AQI value reveals that the sampling sites Bordowali, Netaji Palli and Das Para fall under poor category during pre monsoon and Baishnab Tilla (pre and post monsoon) and Kanchanpalli (post monsoon) fall under satisfactory category. The remaining sampling sites fall under moderately polluted category in and around the A.D. Nagar, Dukli and Badharghat Industrial Cluster areas during pre and post monsoon. The major reasons for high particulate matter concentration may be due to rapid increase in industrial activities, vehicular movement in the national highway, infrastructural development like construction of flyovers, rail services etc. The dust particles arising from road and uncovered roadside may also responsible for increase the dust load of air. More steps have to be taken by the concerned authority to improve the ambient air quality considering the public health. These steps include closure of high polluting industrial units, encouraging the usage of clean fuel such as CNG, phasing out off older vehicles, strict vigilance for periodic check on vehicle pollution certificates, motivating the people to use public transport. Hence, further air quality study to be carried out on regular interval to monitor the status. It is also necessary to promote awareness campaign regarding air pollution and its health effect.

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