

A PRELIMINARY ASSESSMENT OF RECENT AIR POLLUTION STATUS OF BARDHAMAN DISTRICT IN WEST BENGAL: ESPECIALLY INDUSTRIAL AREA

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Abstract: Air pollution is one of the major problems in the urban areas of India due to different types of sources such as vehicular or automobile, industrial pollution etc. Specially vehicular or automobile pollution and industrial pollution are mainly responsible for air pollution. In this paper the attempt has been made to study a preliminary assessment of the air pollution of different air quality monitoring stations of Bardhaman district in the state West Bengal and the status of several types of harmful pollutants like Carbon monoxide, Lead, CO₂, NO₂, SO₂, SPM, RPM, and PM₁₀ throughout the year. The annual average concentration of different harmful pollutants values is much higher than the residential standard value due to increasing vehicular pollution and industrial pollution of different place of Bardhaman district. In Bardhaman district, the number of various types of motor vehicles and industries are increasing day-by-day.

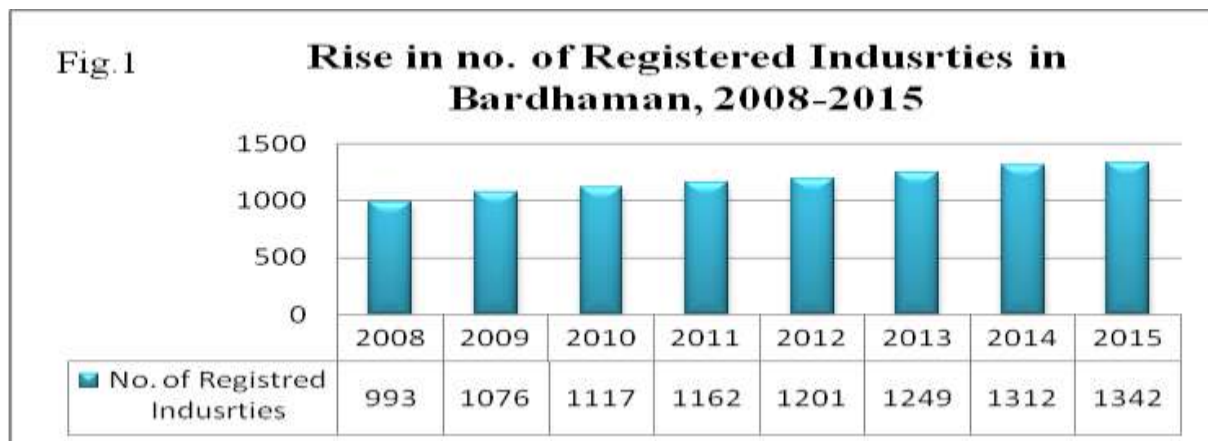
Keywords: Air pollution, harmful pollutants, monitoring stations, vehicles and industries.

I. Introduction:

Air Pollution is the presentation of chemicals, particulate matter, or organic materials that causes mischief and uneasiness to people and other living creatures, or harms the common habitat, of the environment. Air contaminations can be strong particles, fluid beads, or gases. Apart from these they might be natural or man-made. Pollutants are of two types namely, one is primary and another one is secondary. Primary pollutants are substances straightforwardly emitted from a procedure, for example, fiery remains from a volcanic eruption, the carbon monoxide gas from an engine vehicle fumes or sulfur dioxide discharged from industries. Secondary pollutants are not produced specifically. Or maybe, they frame noticeable all around when essential toxins respond or connect. Primary pollutants which are major that outcome from human activities include sulfur oxides (SO_x), nitrogen oxides (NO_x) carbon monoxide, carbon dioxide (CO₂) volatile organic compounds, particulate matter, Toxic metals - like lead, cadmium and copper, Chlorofluorocarbons (CFCs) and other Radioactive toxins.

Sources of air pollution refer to the various locations, activities or factors responsible for the releasing of pollutants in the atmosphere. These sources can be classified into two major categories which are: **anthropogenic sources** (human activity) mostly relating to burning different kinds of fuel and the **natural sources** include dust, methane (emitted by the digestion of food by animals, for example cattle.), radon gas from radioactive decay within the Earth's crust, smoke and carbon monoxide from wildfires and volcanic activity,

Bardhaman district with a population of 77, 23,663 is the 7th most populous district in India according to 2011 census and it has an area of 7024 sq/km² with a density of population 1100sq/km². The district divided into two parts that one is agricultural based eastern portion of the district and western part which is industrial based. In the district the number registered motor vehicles are continuously increases i.e. from 282126 to 587658 (from 2008 to 2015) as per 2015 statistical abstract data. On other side the number of registered factories or industries increases rapidly from the year 2008 to 2015 and the number are 993 to 1342. Air pollution problem in the district by which the residents are struggling much in the recent years, efforts have been taken to carry out a baseline assessment on ambient air quality status of the district based on data provided by air quality monitoring stations (selected by State Pollution Control Board).



Data Sources: Statistical Abstract, 2015

II. Objectives:

1. To find out recent status of ambient air quality in Burdwan district.
2. To point out the variation in the monthly concentration of harmful gases (SPM, RPM, and SO₂ & NO₂) in the district.
3. To find out most vulnerable zone or place in the Burdwan district.

III. Methodology:

The present study is a *Preliminary Assessment of Recent Air Pollution Status in Bardhaman district* which based on Secondary information or data which is analysis through the Excel software. However, The Government organizations from where the secondary information has been collected for the study these are - Census of India; West Bengal Pollution Control Board; and Bureau of Applied Economics and Statistics, Govt. of West Bengal district handbook.

IV. Limitation of the study:

Due to absence of such data sets the present study only describes the status of air quality of the district. Lack of systematic data the present study cannot show the status of health hazards of the district residents suffering due to air pollution problem.

V. Results:

Air pollution is a major problem in Bardhaman district, especially Industrial belt which is western part of the district presently. The West Bengal Pollution Control Board has been regularly monitoring air quality by 9 stations (Benachiti, PCBL More, Bidhannagar, Asansol, Angadpur, Mangalpur, Bumpur, Ranigunj and Jamuria) in Bardhaman district and all these monitoring stations are located in the western part(industrial area) of the district. In 2010-11, the annual average concentration of harmful pollutants like Suspended Particulate matter (SPM) and Respirable particulate matter (RPM) were 243.4 $\mu\text{g}/\text{m}^3$ and 138.3 $\mu\text{g}/\text{m}^3$ respectively. These values are much higher than the industrial & residential standards of 200 $\mu\text{g}/\text{m}^3$ for SPM and 60 $\mu\text{g}/\text{m}^3$ for RPM (permissible limit of SPM and RPM concentration in ambient air) set up by the West Bengal Pollution Control Board. The annual average concentration of harmful gas like Nitrous Oxide (NO₂) in the ambient air was 59.9 $\mu\text{g}/\text{m}^3$ in 2011 – standing at the marginal level to the industrial & residential standard as set by the State Pollution Control Board i.e. 40 $\mu\text{g}/\text{m}^3$. However, the concentration of sulphur dioxide (SO₂) – another harmful gas in the ambient air is 7.8 $\mu\text{g}/\text{m}^3$ where the standard industrial & residential value is 50 $\mu\text{g}/\text{m}^3$. The Air Pollution Index (API) estimated (on the basis of annual average concentration of SPM, SO₂ and NO₂ in the ambient air) for Bardhaman district in

2011 was 287. As per the categorization of zones based on API values, Bardhaman district's industrial western part in 2011 was under severe air pollution category.

The major sources that account for high level of air pollution in the urban areas are the power plants and the automobile sector. According to environmentalists, automobiles are not the main culprits in emitting pollutants; the power plants are the biggest contributors to air pollution.

NOTE: The air pollution Index (API) combines these pollution parameters.

$$API = ((SPM (A)/SPM(S) + SO_2 (A)/SO_2(S) + NO_2 (A)/NO_2(S)) * 100$$

Where, A stands for actual and S for standard.

If this API value lies between 51 and 75 then it is moderate air pollution. For API between 76 and 100 it is heavily air pollution and if the value exceeded 100 it is severe air pollution.

Source: West Bengal, Human Development Report, 2004

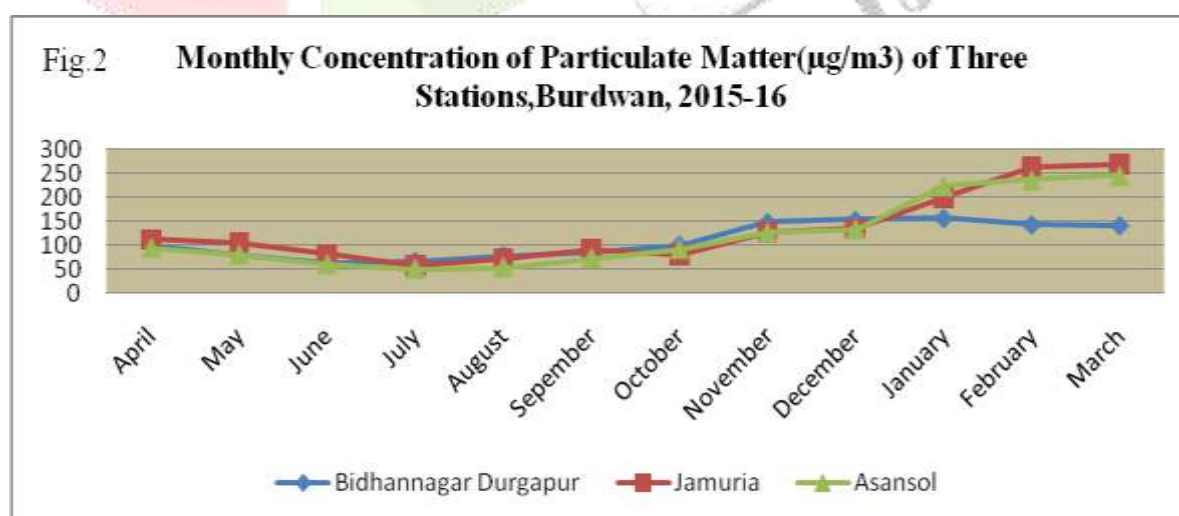
Particulate matter (size > 10 $\mu\text{g}/\text{m}^3$) or PM_{10} $\mu\text{g}/\text{m}^3$:

Particulate matter is 10 micrometers or less than in diameter fine particles. The pollutant particulate matter is monitoring by three semi-automated stations they are Bidhannagar Durgapur, Jamuria and Asansol of the district. In 2015-16, regarding the monthly concentration of PM_{10} , it is found that in all the 12 months, the concentration of PM_{10} is relatively high in the winter seasons of all three stations, where the industrial & residential standards level of PM_{10} value is $60\mu\text{g}/\text{m}^3$.

Table1: Monthly Concentration of Particulate Matter or PM_{10} ($\mu\text{g}/\text{m}^3$) of Three Monitoring Stations, Bardhaman, 2015-16

Months	Bidhannagar Durgapur	Jamuria	Asansol
April	99.98	110.96	94.08
May	78.99	104.97	80.07
June	63.55	80.39	60.12
July	65.19	56.69	50
August	77.39	71.76	53.86
September	86.65	89.81	73.11
October	99.2	79.87	91.36
November	147.23	125.47	126.47
December	152.07	133.33	133.13
January	156.05	197.5	222.93
February	142.4	261.67	235.4
March	140.8	267.01	244.54
Average	109.13	131.62	122.09

Data Source: West Bengal Pollution Control Board, Annual Report, 2015-16



Standard level of PM_{10} is $60\mu\text{g}/\text{m}^3$

Mean monthly average concentration of harmful pollutants in Bardhaman district:

The variation in the mean monthly concentrations of different harmful pollutants are Suspended particulate matter (SPM), Respirable particulate matter (RPM), Sulphur dioxide (SO_2) and Nitrous oxide (NO_2) for the year of 2010-11. The respectively

figures from below, it is observed in general from all these figures that during the winter months (November, December, January, February and March), the concentration of pollutants in the ambient air is higher than all other months of the year. The probable reason may be due to the phenomenon of temperature inversion (where the decrease in temperature with height is much less than normal or in extreme cases, the temperature increases with height) during the winter months.

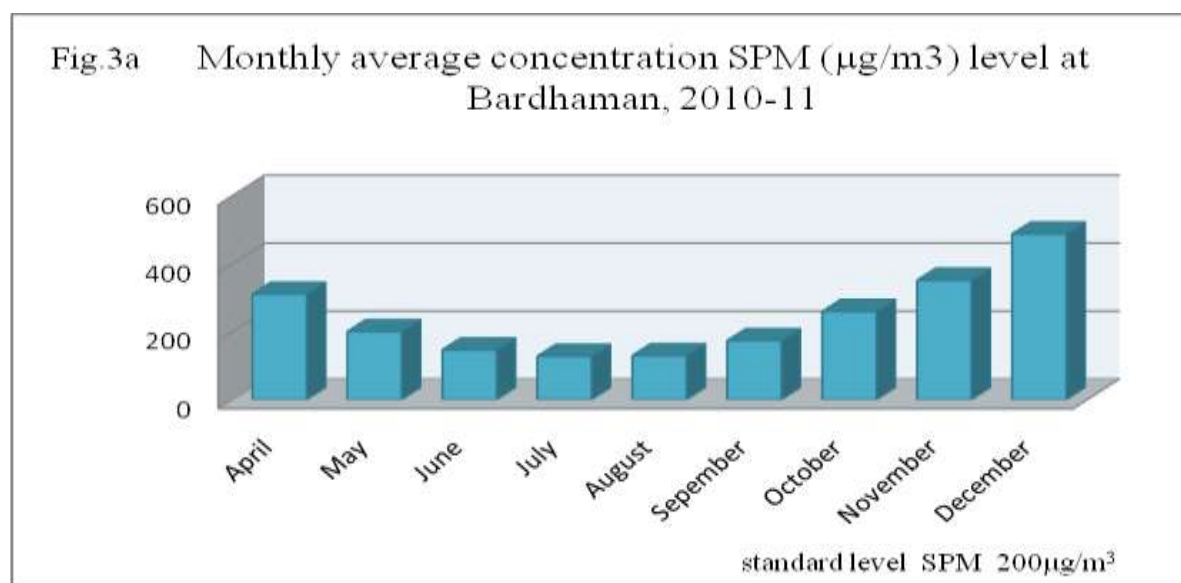
Suspended particulate matter (SPM):

The concentration of Suspended particulate matter (SPM) in the ambient air all the months of the year 2010-11 is above the industrial & residential standard $200\mu\text{g}/\text{m}^3$ in the winter season (November, December, January and February) than the other seasons of the year. Even the average value of the year is high $244\mu\text{g}/\text{m}^3$ than standard level.

Table2: Mean monthly concentration of Suspended particulate matter (SPM), Bardhaman, 2010-11

District	April	May	June	July	August	September	October	November	December	Avg
Bardhaman	311	201	147	128	130	174	260	352	488	244

Data Source: West Bengal Pollution Control Board, Annual Report, 2010-11



Respirable particulate matter (RPM):

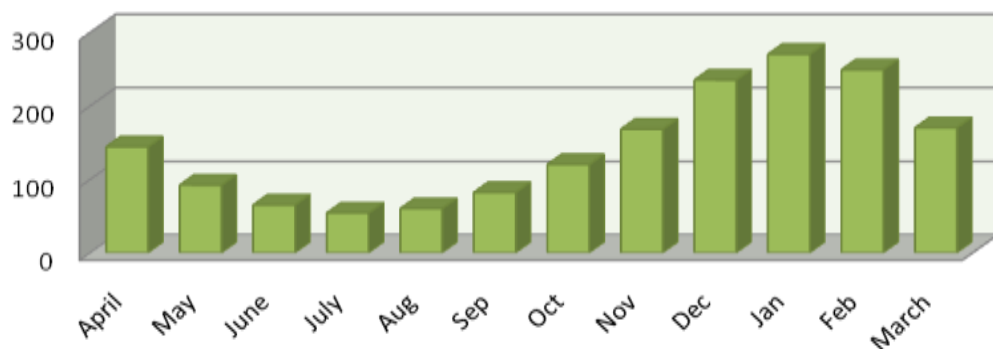
The mean monthly concentration of Respirable particulate matter (RPM) has exceeded the permissible limit of $60\mu\text{g}/\text{m}^3$ in the winter season, especially November to March month compared to summer and rainy season and where the mean value of the pollutant is $138\mu\text{g}/\text{m}^3$ in the year.

Table3: Mean monthly concentration of Respirable particulate matter (RPM) Bardhaman, 2010-11.

District	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	Avg
Bardhaman	144	92	65	54	60	82	120	168	235	270	249	170	138

Data Source: West Bengal Pollution Control Board, Annual Report, 2010-11

Fig.3b Monthly average concentration RPM ($\mu\text{g}/\text{m}^3$) level at Bardhaman, 2010-11



standard level RPM $60\mu\text{g}/\text{m}^3$

Sulphur dioxide (SO₂):

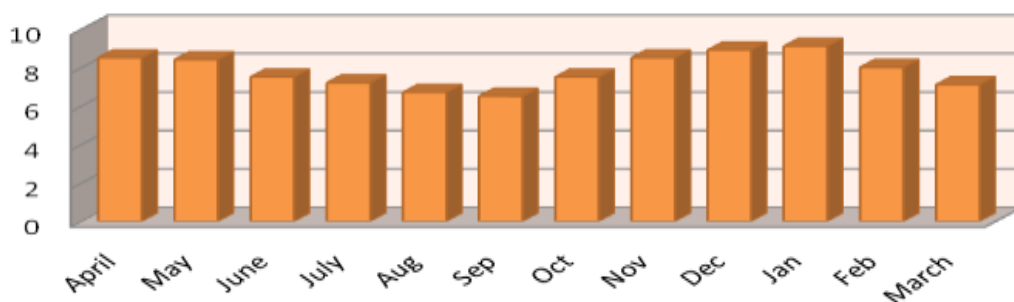
In case of sulphur dioxide concentration in the ambient air in different months for the year 2010-11, it has been found that for all the months the concentration of SO₂ in Bardhaman district is much below the standard limit (i.e. the concentration of the gas is well within the permissible limit of $50\mu\text{g}/\text{m}^3$). As is mentioned earlier, this low concentration of SO₂ in the air may be due to low sulphur content of the local coal.

Table4: Mean monthly concentration sulphur dioxide ($\mu\text{g}/\text{m}^3$) of Bardhaman, 2010-11.

District	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	Avg
Bardhaman	8.5	8.4	7.5	7.2	6.7	6.5	7.5	8.5	8.9	9.1	8	7.1	7.8

Data Source: West Bengal Pollution Control Board, Annual Report, 2010-11

Fig.3c Monthly average concentration SO₂ ($\mu\text{g}/\text{m}^3$) level at Bardhaman, 2010-11



standard level SO₂ $50\mu\text{g}/\text{m}^3$

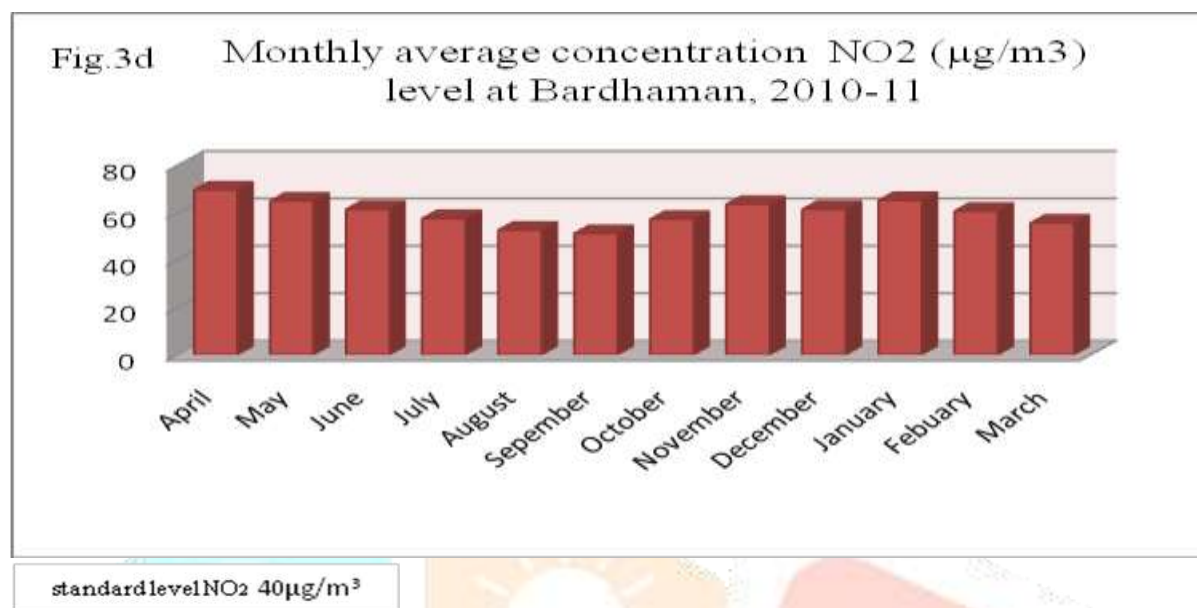
Nitrous oxide (NO₂):

Regarding the mean monthly concentration of nitrous oxide, it is found that in all the months of the year 2010-11, the concentration of NO₂ is relatively high in the winter months (especially in December) compared to all other months of the year. In December, the concentration of NO₂ is much above the permissible limit set for the residential areas i.e. $80\mu\text{g}/\text{m}^3$.

Table5: Mean monthly concentration of nitrous oxide ($\mu\text{g}/\text{m}^3$) of Bardhaman, 2010-11.

District	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March	Avg
Bardhaman	69.6	64.9	61.4	57.5	52.6	51.2	57.2	63.5	61.4	65.1	60.6	55.6	59.9

Data Source: West Bengal Pollution Control Board, Annual Report, 2010-11.



VI. Discussions:

From the analysis of the data it has been shown that the ambient air quality is very poor due to many harmful pollutants such as PM₁₀, SPM, RPM, SO₂, NO₂, and many more of the Bardhaman district. The major contribution to air pollution is conceived to be the harmful emission of gases from power plant and the emission of particulates from vehicles. Western part of the district most of industries are located and several harmful pollutants are found here, that's why the air pollution is much higher than the agricultural based eastern part of the district. Industries and automobiles both are increasing day-by-day in the district which helps to release different harmful gases in the air of the district.

According to the data analysis, the variation in the mean monthly concentrations of different harmful pollutants, it is clear that every pollutants value is higher than the standard limit. This paper is mainly highlighted to find out the status of air quality with the help of PM₁₀, SPM, RPM, SO₂ and NO₂ pollutants parameters.

VII. Concluding Remarks:

The burning of coal as an industrial and domestic fuel accounts for a significant proportion of pollutant emissions, especially SPM. Surprisingly, SO₂ concentrations are relatively low (within WHO guidelines) which is due to the low sulphur content (0.3 percent) of the local coal. At present besides industrial pollution a significant amount of air pollution is contributed by the automobile sector of the Bardhaman district.

However at recent times due to strict policies undertaken by the State Pollution Control Board industrial and vehicular emissions have, to a large extent, stabilized and in some cases declined.

References:

- Annual Report, 2010-11 and 2015-16. Published by West Bengal Pollution Control Board, Govt. of West Bengal
- Census of India 2011, Primary Census Abstract, Orissa and West Bengal in CD. Published by Office of the Register General, India, New Delhi.
- Croxtan, Frederick E., Cowden Dudley, J. and Klein, Sidney, 1975. Book Entitled Applied General Statistics (3rd Edition). Published by Prentice-Hall of India Pvt. Ltd. New Delhi.
- Bradhaman District Statistical Handbook, 2011. Published by Bureau of Applied Economics and Statistics, Govt. Of West Bengal
- Narain & Raychaudhury, 2009. Paper Presentation on "Leapfrog to clean air: Kolkata's agenda for action" Centre for Science and Environment, Kolkata.

Parivesh,, News Letter published by Central Pollution Control Board, Govt. of India. Available at <http://www.cpcb.nic.in/air.php>

Sengupta B., 2001. Paper Presented on “Vehicular Pollution Control In India

Technical & Non-Technical Measure Policy” at Regional Workshop on Transport Sector

Inspection & Maintenance Policy in Asia Organized by ESCAP/UN (DESA) in Bangkok.

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