

Research Report
On
AIR AND NOISE POLLUTION STATUS DIFFERENT PLACE IN
HALDIA AND ITS IMPACT



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CERTIFICATE

This is to certify that Mamata Pramanik Roll PG/VUEGG19-GEO-IVS No 018 has prepared the report on “**AIR AND NOISE POLLUTION STATUS DIFFERENT PLACE IN HALDIA AND IT’S IMPACT**” for M.SC Semester- IV examination in Geography 2023 as partial fulfilment of paper GEO 496.2. It is also certified that the present dissertation is her own work and may be placed before the Examination for Evolution.

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Date:

Signature

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**AIR AND NOISE POLLUTION STATUS
DIFFERENT PLACE IN HALDIA AND IT'S IMPACT**

CHAPTER-1

1.1.INTRODUCTION :

At the confluence of the Hooghly and Haldi Rivers sits the industrial town of Haldia. The petrochemical sector in Haldia is well-known. Due to ongoing urbanization and industrialization, crude oil and coal are transported here by ship to meet domestic demand for energy and transportation. refinement of imported crude oil in this commercial district. West crude material contaminated the environment and the adjacent waterways during oil refining. Wastewater containing phenolic compounds present a serious discharge problem due to their poor biodegradability, Hi toxicity and ecological aspects ([O.Abdelwahab et.al,2008](#)).Oil refineries release toxic water into adjacent rivers or bodies of water. The local population, animals, and plants are significantly impacted by the toxic gas produced from the battery factory as well as the contaminated decomposing water released from the sugar mill. Additionally, this region's ecosystem has been harmed by imported coal, vehicle smoke, industrial fumes, vehicular moisture, and industrial noise. The epidemiology and laboratory studies also demonstrated that ambient air pollutants (For example, PM, O₃, SO₂ and NO₂) contributed to various respiratory problem including bronchitis, emphysema and asthma ([Ling et al,2012](#)). People in the neighborhood are also suffering from numerous diseases as a result of environmental degradation brought on by contaminants. As an illustration, consider allergies, respiratory issues, skin issues, etc. The issue of cataracts in people's eyes is being seen widely in this area as a result of excessive pollution. As far as humans are concerned an air pollutant may cause or contribute to an increase in mortality or serious illness or may pose a present or potential hazard to human health ([kamal and kastans,2007](#)). The surrounding agricultural land and vegetation have been negatively impacted by the increased airborne dust due to the increased pollution. Winter is when there is the most pollution. Globally, outdoor air pollution is a substantial environmental and health risk factor, with the world health organization (WHO) calling air pollution the silent killer ([F.Taghizadeh Hesary et.al,2020](#)).One of the main sources of water pollution is polluted water produced from various industrial plants, particularly the sugar industry. Several chemicals are used in sugar industries mainly for coagulation of impurities and refining of end products, Ca (OH)₂ is used to clarify and to increase PH of juices, A small quantity of H₃PO₄ is added prior to limiting to improve clarification ([Kushwaha,2013](#)). As the polluted water generated by the sugar industry devastated the aquatic habitat, it also had a highly negative impact on the people living in the nearby areas, leading to a variety of physical problems for them. Effluents from petrochemical industries polluted surrounding water bodies and river the composition of petrochemical

wastewater is extremely] complicate, and in which pollutants are of high concentration and hardly to be degraded(Cong li. et al ,2011).The resulting water pollution is a serious threat to the well-being of both the earth and its pollution (Joshua nizeal halder and M.nazrul islam,2015).In order to control water pollution,the polluted water discharged from the industrial plants should be treated using various scientific methods and the polluted water should be captured in artificially created reservoirs instead of being directly discharged into a water body or river. The activated sludge process is the most widely used biological wastewater treatment for both domestic and industrial plants in the world (Yuansong wei et.al,2003). Exhaust emissions from industrial enterprises must be purified before being released into the atmosphere in order to reduce air pollution.

1.2. LITERATURE REVIEW:

In the paper “Ambient Air Quality Assessment in major Petrochemical Industrial Hubs of India”, (Bhushanam peril et al, 2018) -This paper focuses on five major petrochemical industrial clusters viz, Ankleshwar, Haldia, Manali, Manglore and Navi Mumbai. Annual average concentration of PM10, in petrochemical clusters is above the prescribe standard limits in three cities- Ankleswar, Haldia, and Navi Mumbai. And NO2 in Navi Mumbai is beyond the prescribe limit. This pollutant affects the health of peoples living in vicinity to petrochemical industrial clusters.

In this paper “Human Health Effects of Air Pollution”, (Marilena Kampa et al, 2007)- Increased combustion fossil fuels in the last century is responsible for the progressive change in the atmospheric composition. Air pollution has both acute and chronic effects on human health, affecting a number of different system and organs. It Rangers form minor upper respiratory irritation to chronic respiratory and heart diseases, lungs cancer bronchitis in adults, Asthmatic attacks etc.

“Air Pollution Status: A Case Study in West Bengal”, (Debarjati Roy et al, 2019) - Air pollution creating health hazard and may cause death. Kolkata is more polluted than Haldia and less polluted than the New Delhi respect to NO2 and PM2.5. Major pollutant of air pollution is- SO2, NO2 PM2.5 and PM10. This pollutant responsible for respiratory heart and cardiovascular disease.

In the paper “**Air Pollution and Human Health in Kolkata, India: A Case Study**”, (Md. Senaul Haque and R.B Singh)- The study was held on 17 air pollution station in Kolkata. Out of 17 ambient air pollution station five fall under critical and 12 fall under the high category of NO₂ concentration, while for RPM, four record critical and 13 come under high pollution category. In this area Vehicular emission is 51.4%, industrial emission is 24.5% and Dust partical 21.1%. In this

In the paper “**Noise Pollution and Human Health: A Review**”, (Hiral J.Jariwala et al,2017) - Environmental noise pollution, a form of air pollution is a threat to health and well-being. It will continue to increase in magnitude due to population growth. Noise pollution cause of various health effect- hearing loss, sleep disruption' cardiovascular disease, reduced productivity etc.

In the paper “**Environmental Noise Pollution Monitoring and impacts on Human Health in Dehradun city, Uttarakhand, India**” (Dev Pramendra)- In this paper focuses on noise pollution in Dehradun city. Noise pollution level (50.70-82.54dB) more than recommended Permissible level (30-75dB) are observed in the survey chock, Prince chock, Saharanpur chock, Gandhi park and clock tower. high level of noise cause stress on human health such as auditory, nervous system, Insomnia, Hearing loss etc.

“**A Study of Noise Pollution and Impact on Human Health**”, (Musbah Aissa and Mohamed)- Noise represent an important public health problem that can lead to hearing loss, sleep disruption etc. Noise adversely affects General Health and well-being in the someway as does chronic stress. The research carried out in the various land use reveals that 80% of the commercial area is export to the highest risk of noise pollution. Residential area was exposed to 18.7% noise pollution.

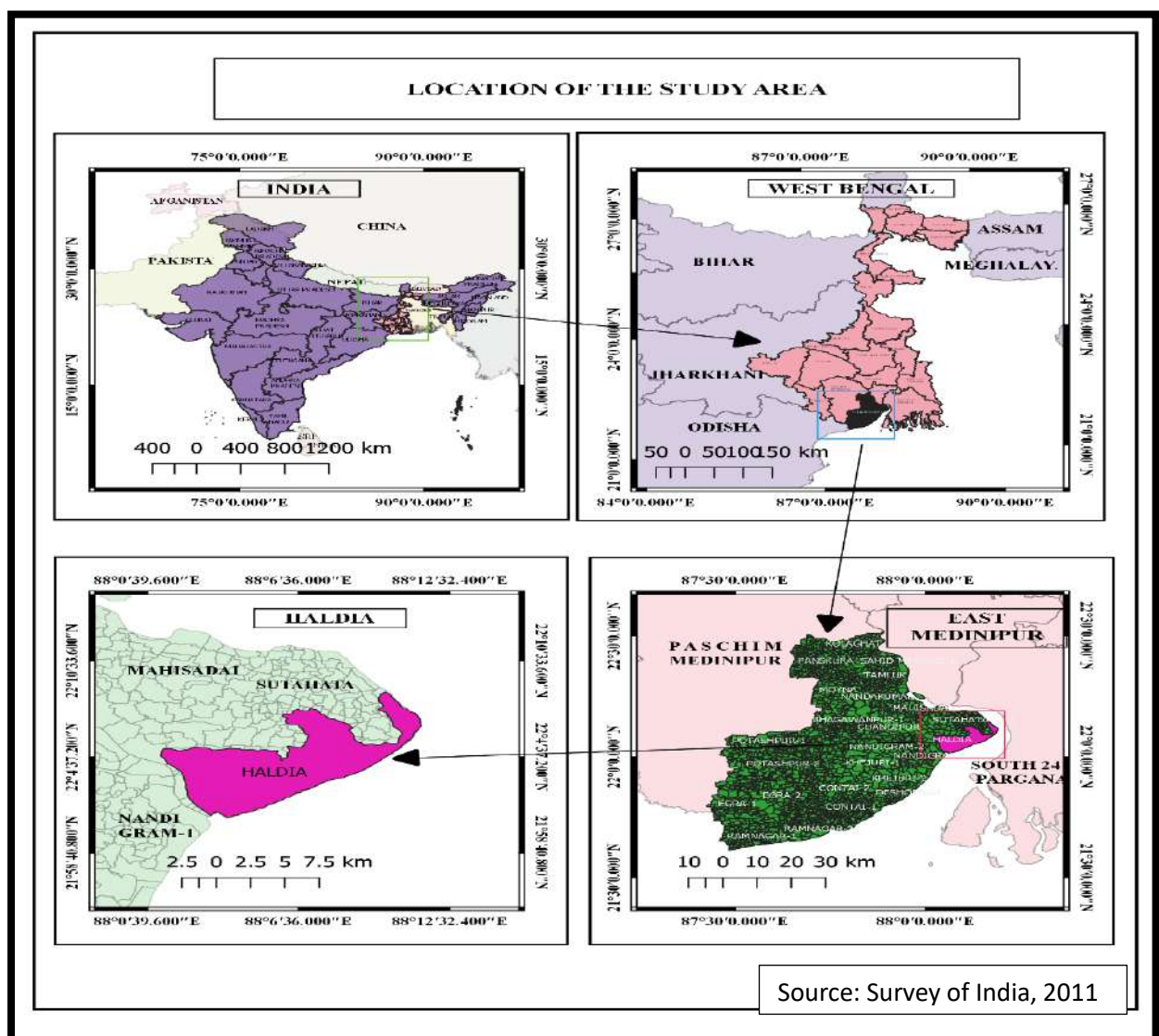
1.3.OBJECTIVES:

- Assessment of Air Quality
- Assessment of Noise Level in Different Industrial Zone.
- How to various types of pollution impact on human health and biota.

CHAPTER-2

2.1. LOCATION MAP OF THE STUDY AREA:

Haldia is a Port based industrial town located at the confluence of two river Hooghly and haldi, of purba Medinipur district. On the other hand, it is located at the 52 km away from kolaghat and 50 km up stream of Bay of Bengal. Haldia industrial town is extended from 22.0627°N to 88.0833°E. Haldia is connected three nodes of transportation like rail, waterway, road. The 4-lane national highway (NH-41) from haldia industrial zone connected national highway (NH-6) near kolaghat. Haldia has a port which is a major and only coastal port in west Bengal. Crude oil, coal and other goods are imported from this port and imported goods are distributed to different part of the country from this region.



2.2. GENERAL INFORMATION ABOUT STUDY AREA;

Fig No: 2.1 Location Map of The Study Area

Haldia is an industrial port city in East Medinipur district in the Indian state of West Bengal. It has a major river port and Industrial belt located near the mouth of the Hooghly River. Petrochemical Industry is the major industry in this area. Petrochemical Industry is the major industry in this area. This area communication system is accessible, three types of communication system such as rail, road and water way play an important role. The Haldia Township is bordered by the Haldi river, an offshoot of the Ganges River. Haldia has several major factories, including South Asian Petrochemicals Ltd. Indian Oil Corporation Limited (IOCL), Haldia Energy Limited, Exide, Shaw Wallace, Tata chemicals, Haldia petrochemicals, India Power Corporation Ltd. Hindustan Lever, MCPI Private Limited (formerly Mitsubishi chemical corporation India), S.J Constructions and LTC &Co.

2.3. HISTORICAL BACKGROUND:

The development of Haldia Urban Industrial Complex can be traced back to the establishment of Haldia Dock Complex in 1959. As an adjunct port to Kolkata, Haldia Dock Complex started its operations in 1968 and further strengthened with the commissioning of the complex in 1977. Primarily a port-based industrial city, there are several factories including South Asian Petrochemicals Limited, Indian Oil Corporation Limited (IOCL), Exide, Shaw Wallace, Tata Chemicals, Petrochemical Complex (Haldia Petrochemical) and Hindustan Lever that have been set up here. Additionally, many foreign companies such as Mitsubishi Chemical Company (MCC) have also invested in this complex. From 1991 to 2004 an estimated Rs 10,000 crore was invested in the Haldia industrial complex which accounted for 36 per cent of the total investment made by West Bengal. Notably, the Haldia Petrochemicals project is the second largest of its kind in India.

Haldia is quickly rising as a major industrial area not only in West Bengal, but also across Eastern India. Featuring approximately 400 industrial units, the area has an estimated investment of over Rs 112 billion, providing direct employment to roughly 12000 people and indirect employment to more than 50000 individuals. Additionally, due to downstream and logistical needs, there is a vast amount of manpower engaged in pertaining activities such as trucking, trailer movement and tanker transportation.

In pursuit of its goal to become the most sought-after industrial destination in Eastern India and the “gateway to south-east Asia”, Haldia is being transformed. To accomplish and maintain this

position, Haldia Development Authority (HDA) has been hard at work fostering world-class infrastructure facilities.

The page that follows displays a map of the Haldia Dock Complex, industrial complex and overall municipal town area. Haldia has experienced accelerated growth over the past decade, with annual population and workforce increases of 5% and 6%, respectively (5.98% for males, 14.12% for females), between 1991 to 2001. This industrial expansion drew in about 39% of the total population.

investment in West Bengal the era of liberalization, privatization and globalization. Development of Haldia urban complex has been accelerated.

2.4. PHYSIOGRAPHY:

LAND: 5.8mtrs to 10mtrs above mean sea level. For setting of large-scale industrial plants. A good amount of land is available in newly developed town.

GEOLOGY: Khodalites, Chamockites, Quartzites, and Quartz veins. the haldia formation during the Middle Holocene period with the composition of fine sand, silt and clay type of materials. The parallel dune ridges were formed as recent dune sand deposit during the Late Holocene period with the composition of semi-compact medium-grained grey sands.

SOIL: Alluvial, Black, Regur and Red terrogeous. These soils were generally non-saline ($EC < 0.5 \text{ dS m}^{-1}$), non-calcareous, and slightly acidic (pH 6.3), with the pH varying from 4.1 to 8.3. The average OC content (1.3%) in the soils of AESR 18.4 was higher than the soils of AESR 6.1 due to the continuous cultivation of rice (Saranagi et al. 2012). The large ACP (63.7%) content indicates organic matter accumulation and intensive microbial activity in these soils.

2.5. CLIMATE:

Haldia has a tropical savanna climate as classified by the Köppen climate classification (Aw). Winter temperatures typically range from 7 to 22 degrees Celsius, with the lowest temperature recorded in January being approximately 7 degrees. Summers can be hot and humid, with average temperatures reaching up to 39-40 degrees Celsius, particularly during the month of May. Relative humidity is also very high.

2.6. DEMOGRAPHY:

Haldia is an industrial town that is still in the process of developing, and thus has a relatively small population. According to the Census of India, Haldia falls under Urban Agglomerations/Cities with populations of 1 Lakh or more. In 2011, Haldia was recorded to have a total population of 200,762 individuals, wherein there were 104,852 males and 95,910 females; the sex ratio was 915. In 2001, Haldia's population was 170,695. The number of residents aged 0-6 was 21,122; in addition, 89.06% of the 7+ demographic had effective literacy rates. Males make up 53% while females make up 47%. 13% of Haldia's population is currently below 6 years old; this rise can be attributed to development and industrialization in the area.

CHAPTER-3

3.1 METHODOLOGY:

The study area was fixed and the actual location was chosen from Google Earth. Using Google Earth, we've divided this study area into two parts 1 Km and 5 Km. Household survey was done with GPS and survey schedule on those areas. Each sampling station was collected from 10 samples through simple random sampling.

With the aid of a noise metre during the primary survey, noise pollution data were gathered from nine sampling stations (Durgachak town, Sutahata, Bandar, Silpa prabesh, Hatibaria, Ranichak, and Manjusree). Measure the excessive amount of noise pollution in this location by entering the noise pollution data into an excel sheet, creating a noise level diagram, and utilising the Noise Exposure Index (NEI).

From the West Bengal Pollution Control Board (WBPCB), secondary air pollution data are then gathered. In the East Medinipur district, the five sample stations of Bhawanipur, Bhunia Ranichak, supermarket, Tamluk, and WBIIDC are chosen. Except for the supermarket, three pollutants are measured at each monitoring site (NO₂, SO₂, and PM₁₀). (NO₂, NO₂, PM₁₀, and PM_{2.5}) are the four pollutants that supermarkets measure. The information gathered is divided into three monsoon seasons (pre-monsoon, during-monsoon, and post-monsoon) and then different pollutants (NO₂, PM₁₀, PM_{2.5}, and SO₂) exhibiting the bar diagram in various sample stations. in addition to utilizing the maximal operator method to build the sub index.

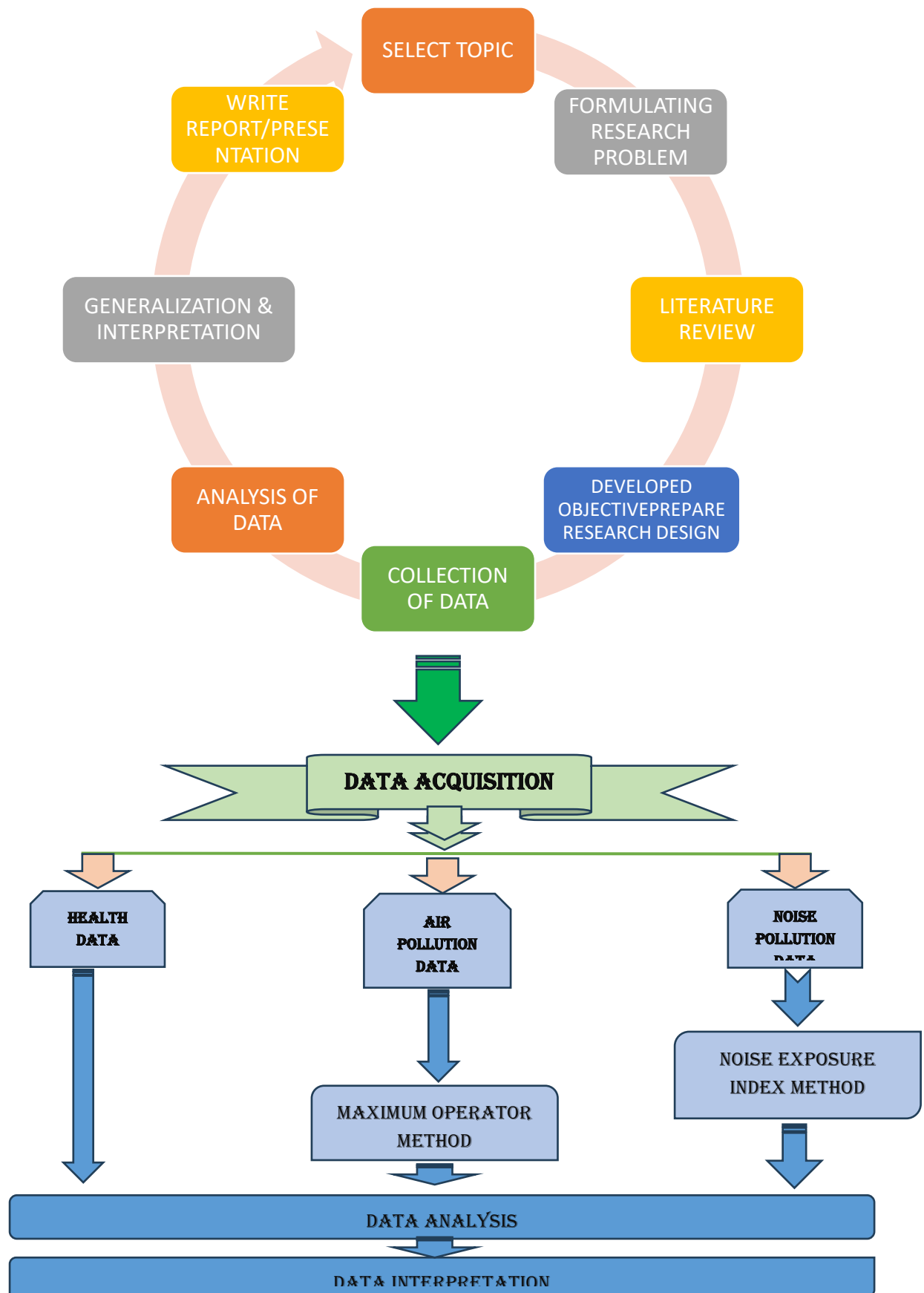


Fig: 3.1 Step of Research

TABLE-1 Type of Pollution and using Method:

SL No.	Pollution	Analytical Method Adopted
1	Air pollution	Maximum Operator Method
2	Noise pollution	Noise Exposure Index Method

TABLE-2 Data Source:

DATA TYPE	DATA SOURCE
Demographic Data	Census of India, 2011
Air Pollution Data	WBPCB (2019,2020,2021,2022)
Noise Pollution Data	Primary Survey

3.1.1. AIR QUALITY SUB- INDEX (AQI):

Establish the sub-indices (for each pollutant).

- Segment Linearity Equation.

$$Isi = \{[(C_{obs} - C_{min})(I_{max} - I_{min})] / (C_{max} - C_{min})\} + I_{min}$$

Where,

I_{si} = Sub index value of the observed pollutant.

C_{obs} = Observed pollutant concentration.

C_{max} = Maximum concentration of AQI colour category that contains $\leq C_{obs}$.

C_{min} = Minimum concentration of AQI colour category that contains C_{obs} .

I_{max} = Maximum air quality value corresponding to $\leq C_{max}$.

$I_{\min}$ = Minimum air quality value corresponding to $C_{\min}$.

- Aggregation of Sub-Indices to get the overall AQI.
- Aggregation can be by simple or weighted average method or summation or multiplication operation or simply a maximum or minimum operator.
- In AQI, it is by Maximum Operator Method.

$$AQI = \text{Max} (I_{s1}, I_{s2}, I_{s3}, \dots, I_{s8})$$

Table: 3 Air Quality Class and Range:

AQI Class	Range	Colour Code	Possible Health Impacts
Good	0- 50		Minimal Impact
Satisfactory	51-100		Minor breathing discomfort to sensitive people
Moderately Polluted	101-200		Breathing discomfort to the people with lungs, Asthma, and Heart iseases
Poor	201-300		Breathing discomfort to most people on prolonged exposure
Very Poor	301-400		Respiratory Illness on prolonged exposure
Severe	401-500		Affects healthy people and seriously impacts those with existing diseases

Source: Central Pollution Control Board (CPCB)

3.1.2. NOISE EXPOSURE INDEX (NEI):

$$NEI=(t1/T1)+(t2/T2)+.....+(tn/Tn)$$

Where,

t1 to tn = The actual limit of exposure at the corresponding noise levels,

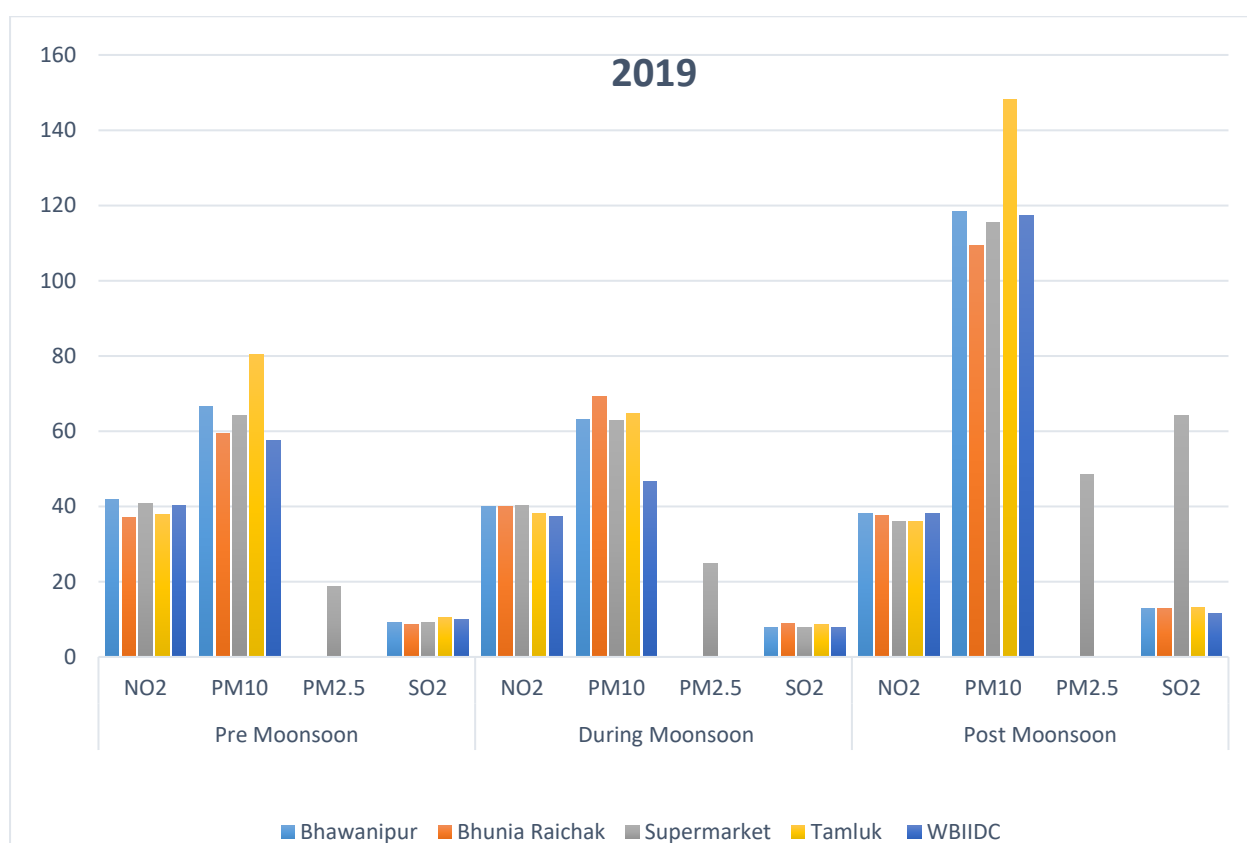
T1 to Tn = The permissible limits of exposure at the corresponding noise levels

If the value of NEI thus calculated is greater than 1, the noise exposure level is deemed to be excessive.

CHAPTER-4

4.1. AIR QUALITY STATUS:

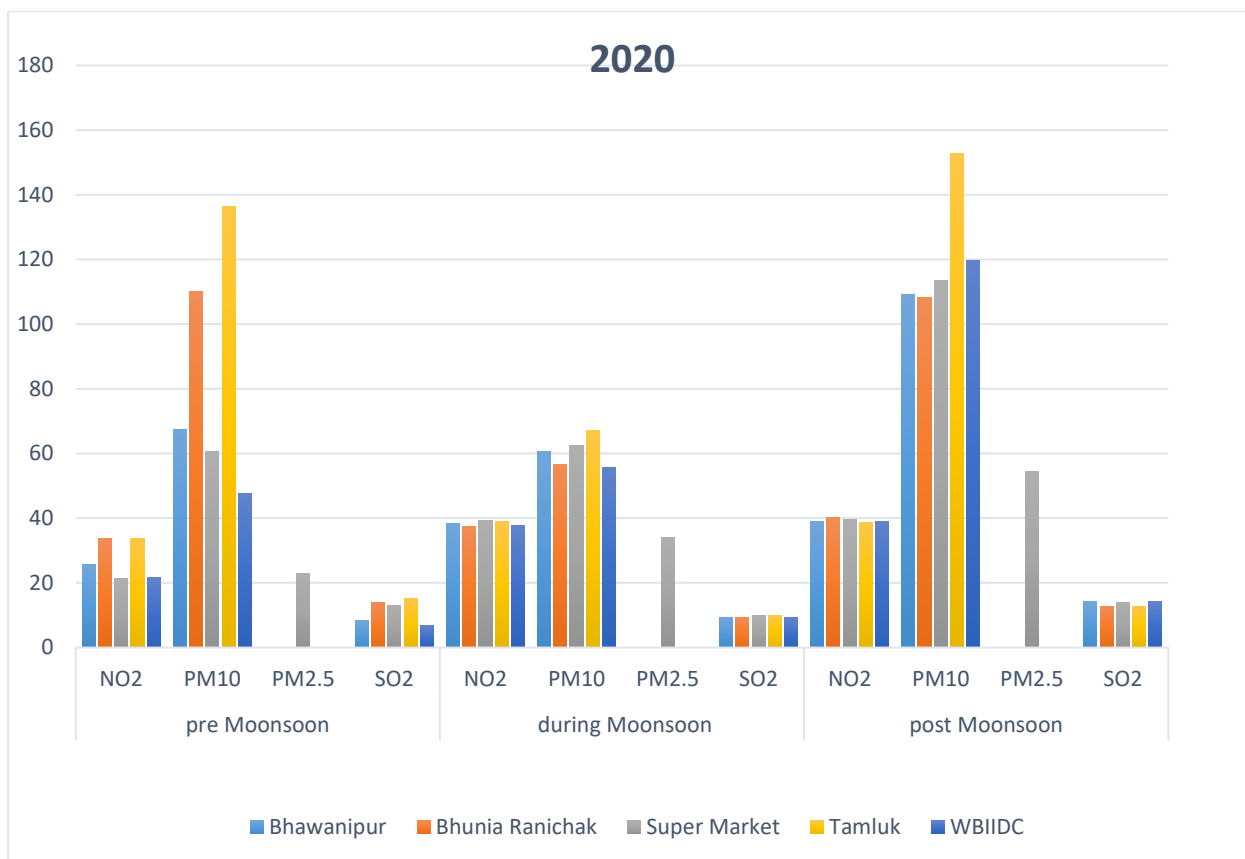
In the current era of global warming, Air Pollution has been one of the major sources of Environmental Pollution in India. Petrochemical hubs spread across various industrial clusters of the country are a major source of Air Pollution (Bhushanam Perli et.al,2018). Air Pollution is a major threat to human health. The United Nations Environment Programme has estimated that, globally, 1.1 billion people breathe in unhealthy air (Md. Senaul Haque and R.B. singh, 2017).



Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.1.1 Different Air Pollution Station & Status 2019

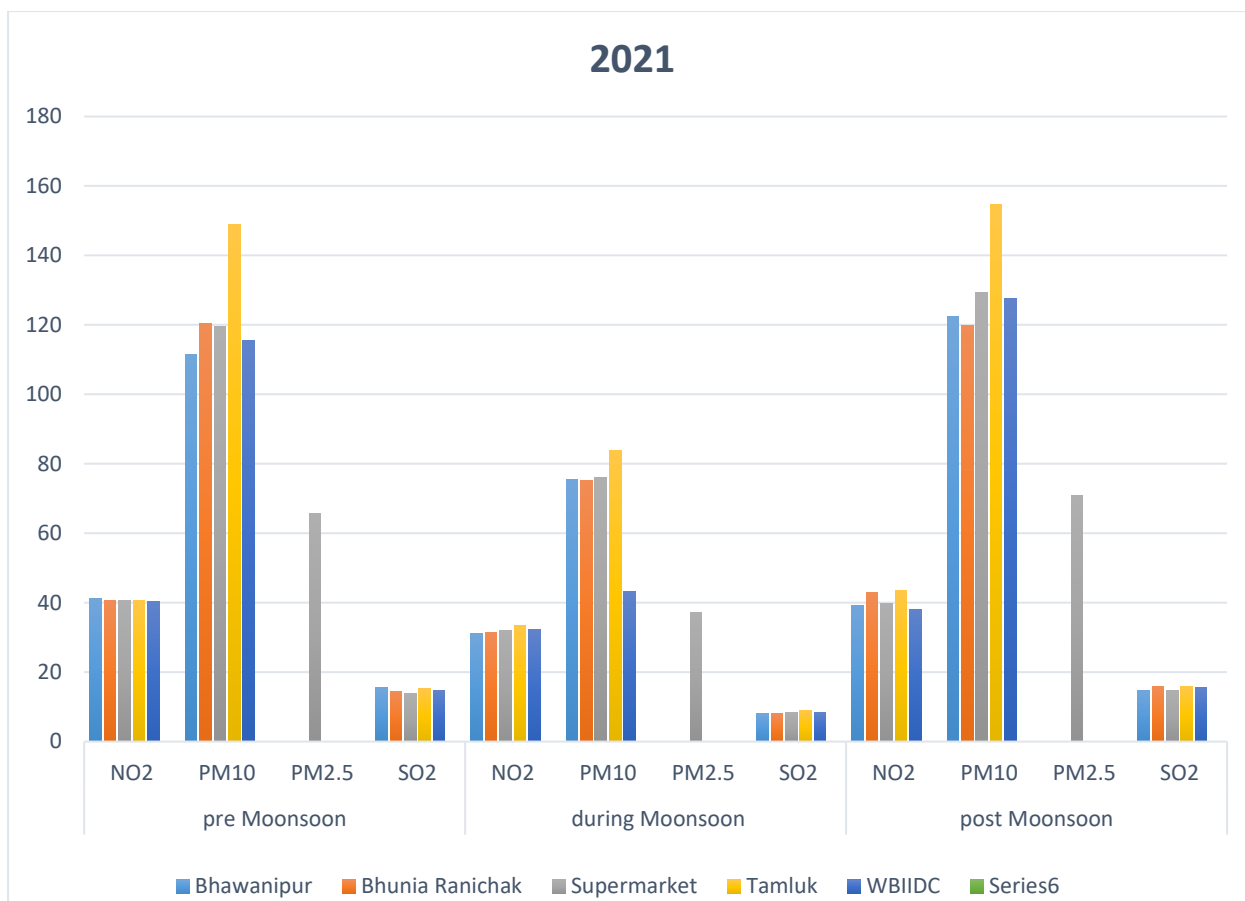
The air pollution concentration is higher during the post monsoon season because of the lack of rainfall, which leads to accumulation of pollutants in the atmosphere. During monsoon, the air quality was found to be better than the other two seasons. The PM10 and PM2.5 levels were both highest in post monsoon. Additionally, SO2 and NO2 levels were highest in pre monsoon. Among the five Air pollution station in East Medinipur district, PM2.5 concentration only at the Supermarket.



Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.1.2 Different Air Pollution Station & Status 2020

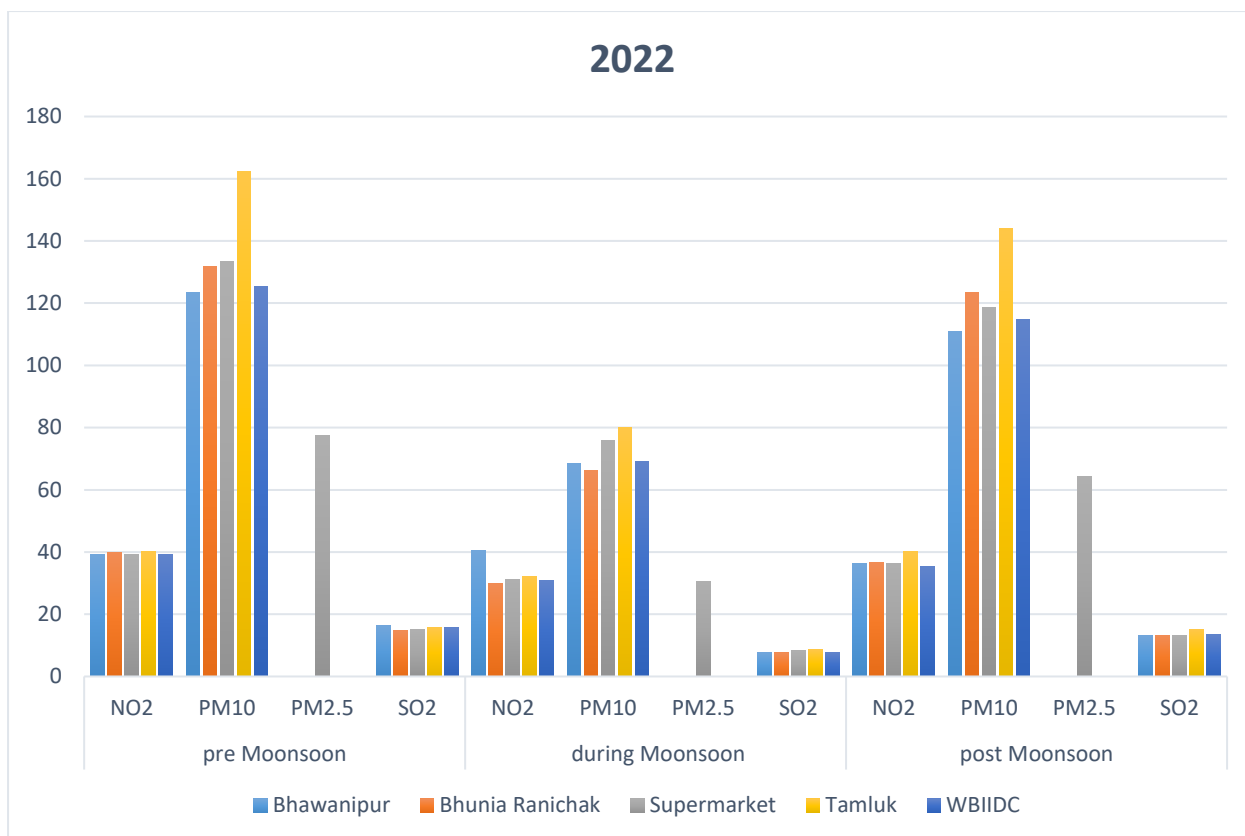
The air pollution levels in East Medinipur district have been analyzed, and the findings reveal three distinct monsoon seasons: pre-monsoon, during monsoon, and post-monsoon. Based on a bar diagram, the air pollution levels were found to be highest during the post-monsoon season and lowest during the during-monsoon season. The concentration of PM10, PM2.5, SO2, and NO2 was the highest during the post-monsoon season and lowest during the during-monsoon season. One of the air pollution stations in East Medinipur district, the Supermarket, was found to have PM2.5 concentration.



Source: West Bengal Pollution Control Board (WBPCB)

Fig No:4.1.3 Different Air Pollution Station & Status
2021

The air pollution levels in East Medinipur district have been analyzed, and the findings reveal three distinct monsoon seasons: pre-monsoon, during monsoon, and post-monsoon. Based on a bar diagram, the air pollution levels were found to be highest during the post-monsoon season and lowest during the during-monsoon season. The concentration of PM10, PM2.5, SO2, and NO2 was the highest during the post-monsoon season and lowest during the during-monsoon season. One of the air pollution stations in East Medinipur district, the Supermarket, was found to have PM2.5 concentration.



Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.1.4 Different Air Pollution Station & Status 2022

A bar graph illustrating the air pollution levels in East Medinipur district divided into three monsoon seasons (Pre-monsoon, During-monsoon and post-monsoon) shows that the highest level of pollution is found in the Pre-monsoon season, while the lowest is seen during the During-monsoon season. Concentrations of PM10, PM2.5, SO2 and NO2 are at their highest levels in Pre-monsoon and lowest in During-monsoon. Out of five air pollution stations located in East Medinipur district, PM2.5 can be observed only at Supermarket.

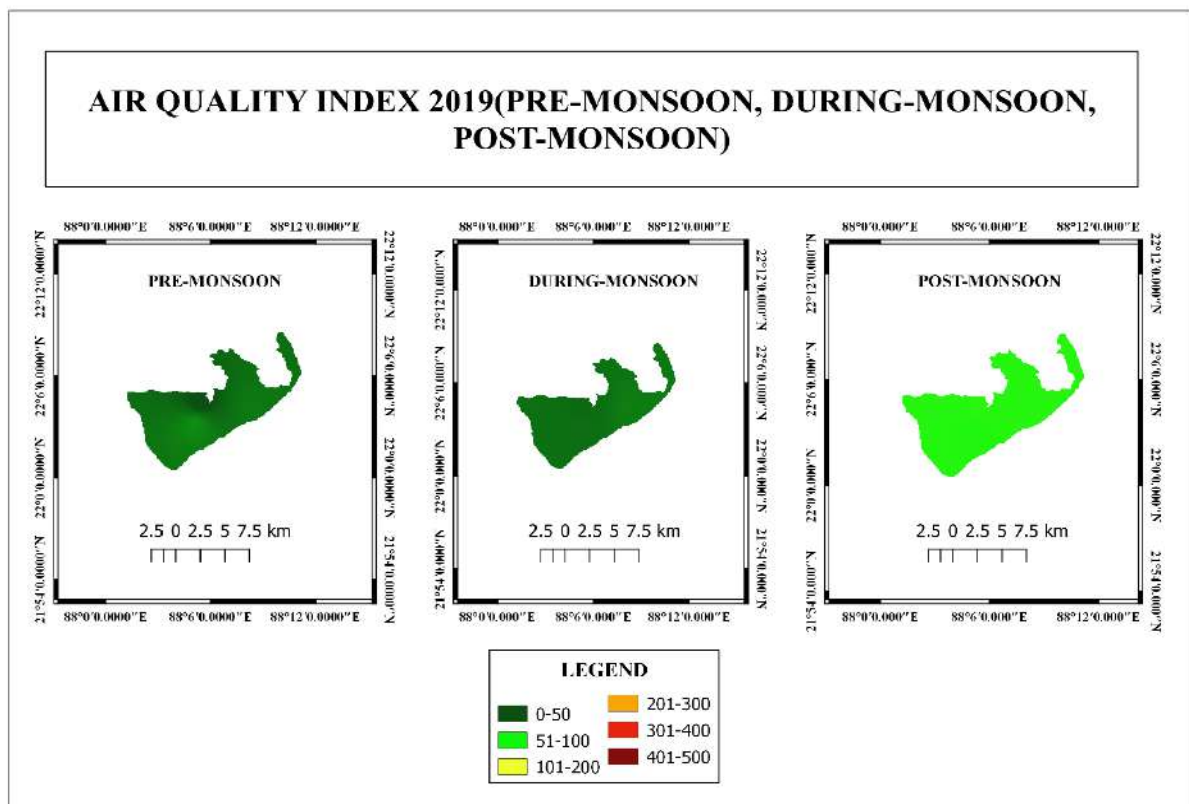


Plate No: 1 Dust Layer on Vegetation Cover (Ranichak)



Plate No: 2 Dust Layer on Vegetation Cover (Durgachak)

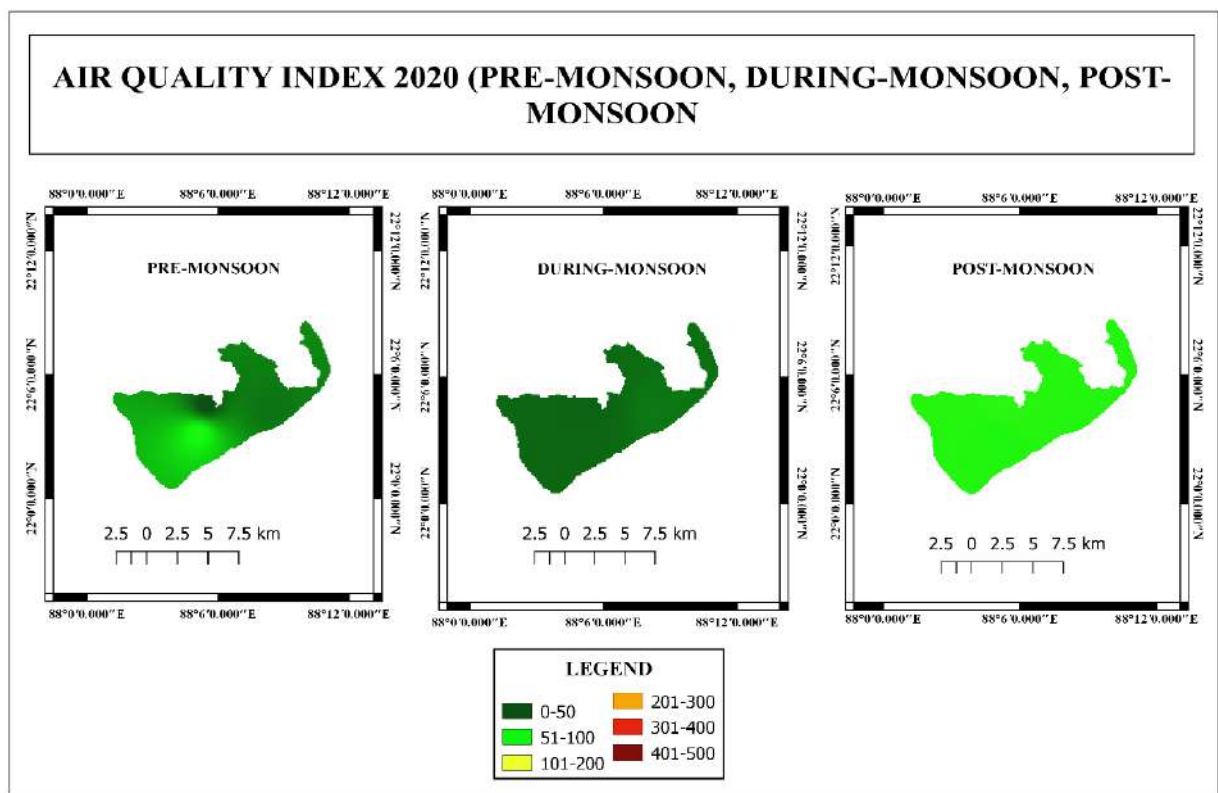
4.2. AIR QUALITY SUB-INDEX:



Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.2.1 Air Pollution Index 2019

Based on four air pollution parameters (PM10, PM2.5, SO2, NO2), a map of air pollution index was created over Haldia municipality for the year 2019. It is evident from the maps that during monsoons pollution levels are good while pre- and post-monsoon pollution levels are satisfactory. A sub-index of pollution was generated by calculating the maximum value of each period. The data suggests that there is higher level of pollutants in the pre-monsoon season than in the post-monsoon season due to lack of rainfall which results in increased airborne pollutants. During monsoons, pollutants are likely to be diluted by rainfall which reduces its amount and impact on the environment.

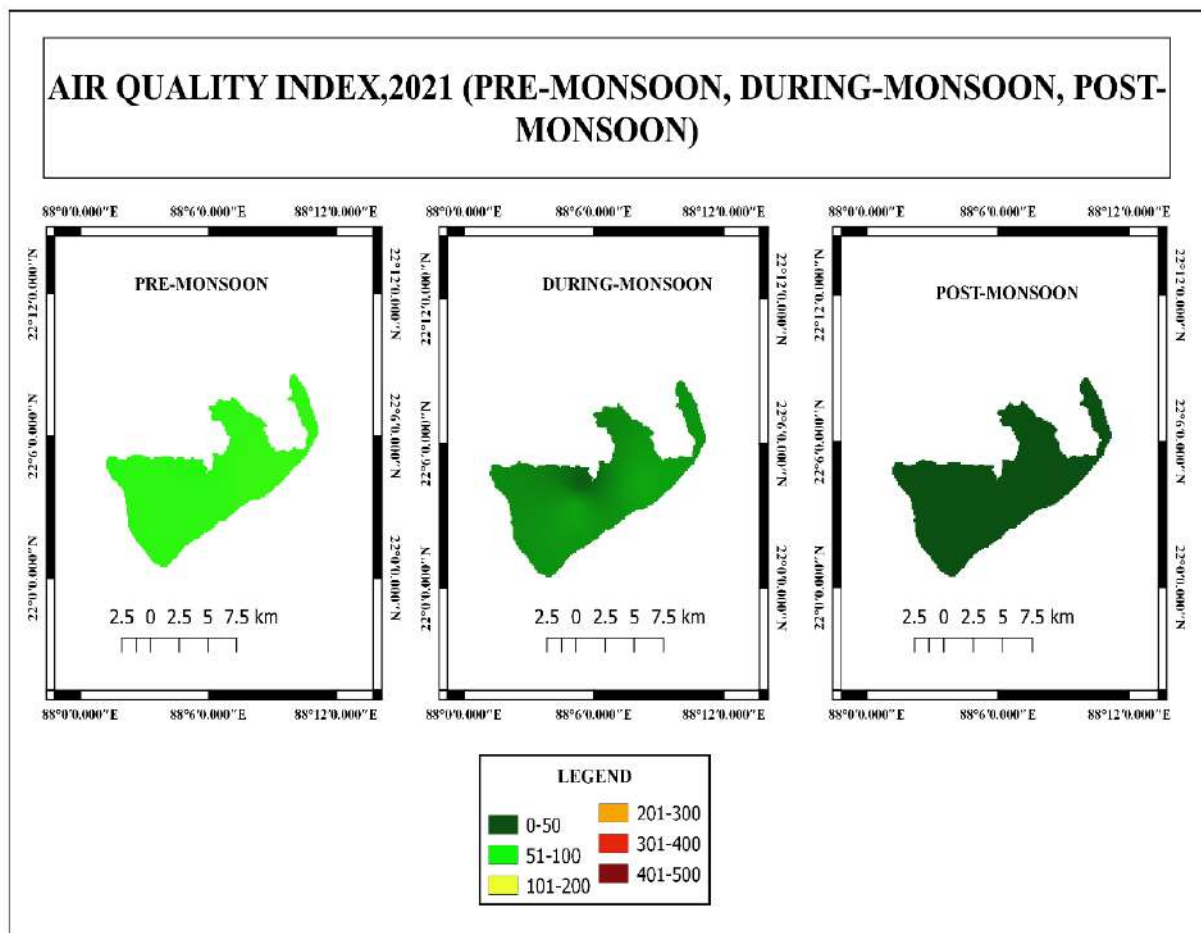


Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.2.2 Air Pollution Index 2020

Based on four air pollution parameters (PM10, PM2.5, SO2, NO2), an air pollution index map has been prepared for the Haldia municipality. The 2020 pollution data is subdivided into three seasonal periods and a pollution sub-index is developed using the maximum pollution value of each period. This mapping indicates that during monsoons there is lower level of air pollution

while pre- and post-monsoon amounts are satisfactory. Moreover, it appears that pre-monsoon levels are higher than post-monsoon levels but still lower than monsoon values. The lack of rainfall in pre- and post-monsoon periods is attributed to the increase in air pollutants as they remain airborne instead of being washed away by precipitation. However, when rain commences in the monsoons, pollutants are mixed with ample rain droplets thus resulting in a reduction in overall pollutant levels.

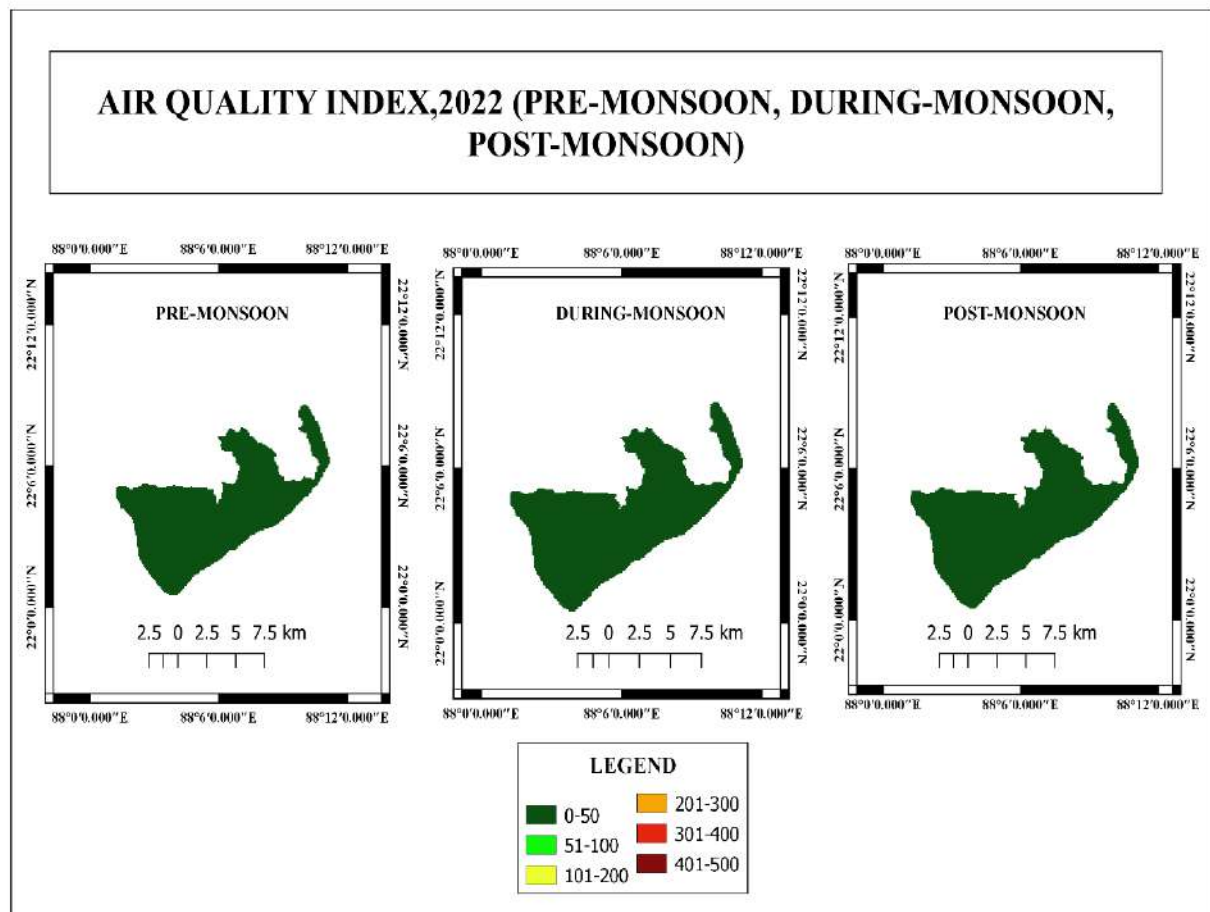


Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.2.3 Air Pollution Index 2021

A map of the air pollution index has been created for the Haldia municipality based on four air pollution parameters (PM10, PM2.5, SO2, and NO2). The 2021 pollution levels have been divided into three seasonal periods and a sub-index was developed by determining the

maximum pollution level of each period. This data indicates that pre-monsoon pollution is greater than monsoon and post-monsoon pollution levels. The major factor attributing to the decreased pollutions during monsoon and post monsoon is due to the lockdown effects brought by COVID-19. With vehicles and industries being closed, the amount of pollutant emissions has drastically reduced.



Source: West Bengal Pollution Control Board (WBPCB)

Fig No: 4.2.4 Air Pollution Index 2022

An analysis of the pollution map of 2022 indicates that air quality in pre-monsoon, monsoon, and post-monsoon seasons is in satisfactory condition as a result of the two lockdowns implemented in early and late 2022 due to the first and second waves of COVID-19. The closures of many vehicles and industries during these enforced periods significantly reduced levels of pollution.

4.3. NOISE QUALITY STATUS:

Noise is one of the physical environmental factors affecting our health in today's world. Noise is generally defined as the unpleasant sounds which disturb the human being physically and physiologically and cause environmental pollution by destroying environmental properties (E.Atmaca et al, 2005)

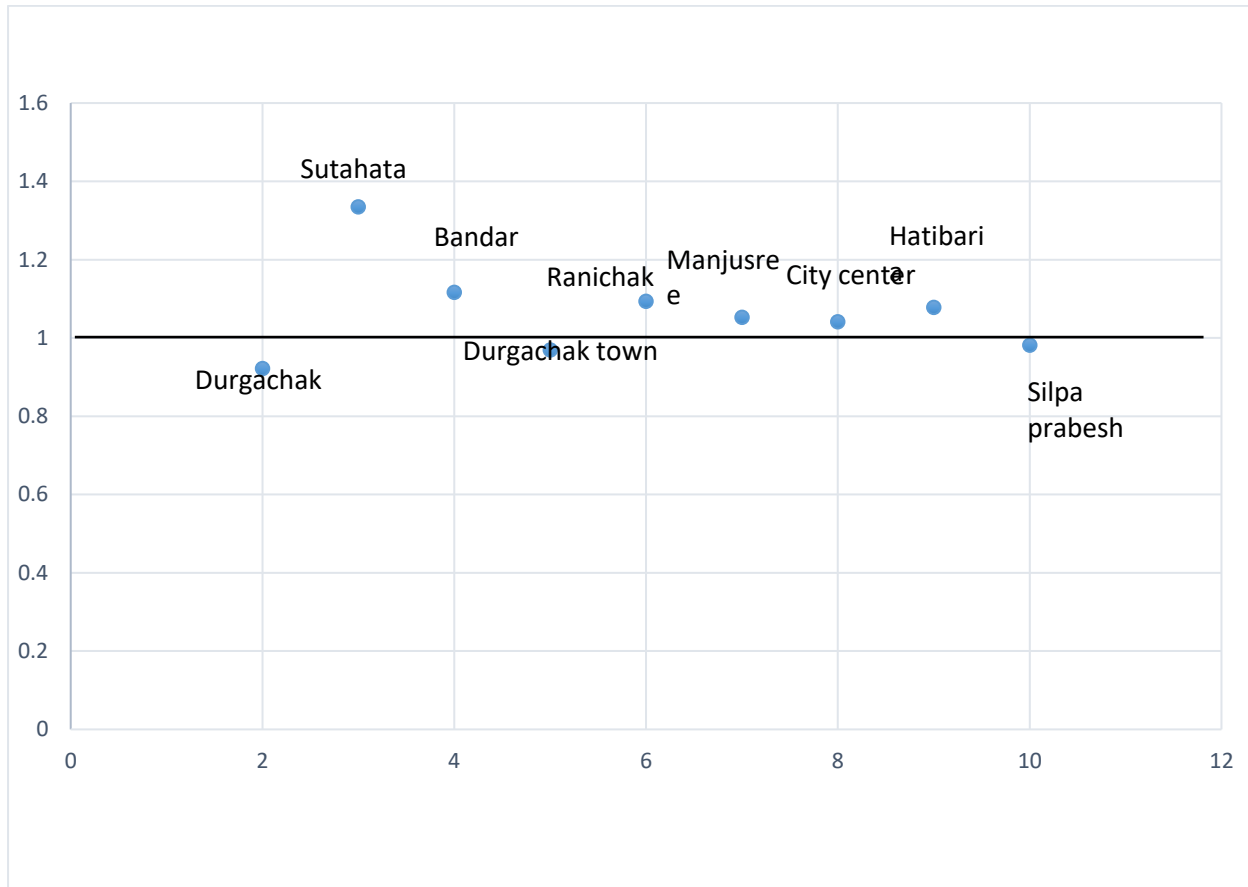


Fig No: 4.3 Noise Exposure Index

Through a primary survey, the noise pollution levels of nine stations in the Haldia industrial area were collected utilizing a noise meter. The location data obtained through the Noise Exposure Index revealed that Sutahata, Bandar, Manjushree, City center and hatiberia areas exceeded the permissible noise pollution limits. Conversely, Durgachak, Durgachak town and Shilpaprabesh areas were found to be below the allowable threshold. Thus, it can be inferred that most of the places in the Haldia industrial area are subject to excessive levels of noise pollution.

4.4. IMPACT:

The emissions from petrochemical industries have a substantial impact on human health and the ambient air quality. The presence of pollutants such as PM₁₀, PM_{2.5}, SO₂, and NO₂ in petrochemical industrial clusters has been linked to cardiovascular Disease, lung cancer, chronic heart-related illnesses, Cardiovascular effects including increased chances of heart attack and stroke, Allergy, Respiratory problem, asthma attacks etc. High levels of these pollutants can have damaging effects on ecosystems including degradation of chlorophyll due to reduced photosynthesis. Moreover, high levels of NO₂ can cause leaf or needle damage along with reduction in growth for vegetation alike. Eye irritation problem very high due to airborne dust.

Haldia, as an industrial city, has seen the development of various modes of transportation; however, this has led to an excessive rise in noise pollution. This poses a serious impact on both people and animals living in the vicinity, resulting in a significant decrease of biodiversity in areas due to noise pollution. Industrial workers have been the most affected by this noise pollution. high levels of noise can lead to serious health effects, such as endocrine problems, cardiovascular disease and digestive reactions. Furthermore, industrial noise plays a significant role in contributing to occupational health hazards. Prolonged exposure to excessive levels of noise can increase systolic blood pressure, stress and even cause hearing impairment.

CHAPTER-5

5.1. FINDINGS:

1. Allergic issues due to pollution are commonly seen among the people of the region. Sometimes the allergy lasts for a long time and in some cases the allergy is seen for some time.
2. During the rainy season, the local populace experiences the formation of black holes on their feet due to pollution. Blackfoot disease is a long-term exposure to inorganic arsenic.
3. The PM 10 concentration in this area is significantly higher than other pollutants.
4. Eye irritation caused by air pollution during the summer and winter months.
5. As a result of air pollution, many people are afflicted with cataracts.
6. Industrial factories emit gases and fumes which can lead to respiratory issues.
7. Crops and vegetables are adversely affected by excessive pollution.
8. The petrochemical industry is the primary source of pollution in this region.
9. Most of the locations in the Haldia industrial area have exceeded the permissible level of noise pollution.

5.2. SUGGESTIVE MEASURES:

5.2.1. REDUCING AIR POLLUTION:

5.2.1.1. To help minimize air pollution, it is recommended that green belts be established in industrial areas through the planting of trees.

5.2.1.2. Trees that are capable of absorbing pollutants should be planted along both sides of the road, or even in the center. For example- Akanda.

5.2.1.3. In order to mitigate air pollution, it is important to purify the smoke emitted from industrial areas (Use Electrostatic Precipitator) before releasing it into the environment.

5.2.1.4. To reduce air pollution, vehicle smoke testing stations should be established at regular intervals near roadways.

5.2.1.5. Coal should be kept in a sealed area to avoid the conceivably hazardous issue of coal dust becoming airborne.

5.2.1.6. Consistently hydrate the pavement with a water tanker and regularly sanitize dust with a Dust Cleaner Machine.

5.2.1.7. The plants should be watered using fountains in order to prevent the accumulation of dust on them, thus avoiding any disruption to their photosynthesis process.

5.2.1.8 Vehicles should be operated at a slower rate in areas with high levels of pollution.

5.2.1.9 Vehicle exhaust is a major source of air pollutant.

5.2.1.10 The collecting of garbage and getting it on fire in dry seasons or dry leaves catching fires is a huge factor for causing air pollution, moreover smoking also causes air pollution and causes the air quality to worsen along with obviously damaging one's health.

5.2.1.11 The concept of recycle and reuse is not just conserve resources and use them judiciously but also is helpful for air pollution as it helps in reducing pollution emissions.

5.2.1.12 The recycled products also take less power to make other products.

5.2.2. REDUCING NOISE POLLUTION:

5.2.2.1. Noise pollution can be mitigated through the implementation of greening and green muffler systems.

5.2.2.2. The administration should be cognizant of the fact that the noise pollution does not exceed the permissible limit.

5.2.2.3. Soundproofing devices should be installed in large industries to reduce noise levels.

5.2.2.4. Decrease the utilization of antiquated vehicles or engines and promote the adoption of new electric powertrains.

5.2.2.5. Proper soundproofing systems should be installed in commercial, hospital and industrial building.

5.2.2.6 Dense tree covering help avoid noise pollution.

5.2.2.7 The sound of the instrument should be controlled within the desired range.

5.2.2.8 Do not use explosive in forests, mountain, or mining areas.

5.3. CONCLUSION:

Air pollution plays a significant role in the deterioration of the environment in the Haldia industrial area. It is well known that this pollution has taken an immense toll on both human health and the living environment. Not only does air pollution cause physical illnesses, but it also has been found to reduce plant productivity, as dust layers hinder chlorophyll's ability to absorb light. Research finds that during summer and winter, air pollution tends to be at its highest point and is progressively getting worse year upon year. Additionally, noise and water pollution have added further destruction to the area. The overall quality of the water has drastically declined while simultaneously pollutants have become more abundant. This contamination has made it so locals now must purchase purified drinking water in an effort stay safe from sicknesses brought on by these pollutants. It is obvious that should these pollutants continue to increase, local inhabitants will develop numerous ailments due to air and water contamination in the near future. Therefore, this paper works towards understanding how various kinds of pollutions are influencing people as well as outlining solutions for tackling them; local people strongly need to unite with administrative functions in order to reduce environmental devastation; furthermore, machines and technology should be developed in order to decrease these contaminants' presence in our atmosphere.

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APPENDIX 1

Table No: 4 Different Air Pollution & Status 2019

Station	2019										
	Pre monsoon				During monsoon				Post monsoon		
	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5
Bhawanipur	41.97	66.4433	0	9.1233	39.995	63.1675	0	7.77	38.134	118.268	0
Bhuniarachak	37.18	59.333	0	8.61667	39.95	69.25	0	9.0025	37.612	109.4	0
Supermarket	40.67667	64.22	18.667	9.04	40.2925	62.7525	24.75	7.9125	36.078	115.4	0
Tamluk	37.9667	80.443	0	10.3766	38.06	64.776	0	8.58	36.03	148.198	0
WBIIDC	40.28	57.556	0	10.076	37.2625	46.65	0	7.795	38.256	117.4	0

Table No: 5 Different Air Pollution & Status 2020

STATION	2020											
	pre monsoon				during monsoon				post monsoon			
	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2
Bhawanipur	25.82	67.33	0	8.3	38.335	60.5025	0	9.4275	39.1	109.2	0	14.368
Bhuniarachak	33.63	110	0	13.82	37.5825	56.6675	0	9.345	40.11	108.134	0	12.772
Supermarket	21.32	60.67	23	13.13	39.2	62.5025	34	10.0175	39.632	113.466	54.4	14.08
Tamluk	33.75	136.33	0	15.12	38.975	66.9975	0	10.045	38.806	152.93	0	12.732
WBIIDC	21.63	47.67	0	6.7	37.8	55.665	0	9.1775	39.01	119.798	0	14.208

Table No: 6 Different Air Pollution & Status 2021

STATION	2021									
	pre monsoon				during monsoon				post monsoon	
	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2	PM10
Bhawanipur	41.3033	111.5566	0	15.55	31.22	75.585	0	8.21375	39.292	122.33
Bhuniarachak	40.6166	120.333	0	14.4566	31.495	75.0825	0	8.0625	42.9766	119.7
Supermarket	40.4933	119.4466	65.666	13.7966	32.13	76	37.25	8.4875	39.688	129.26
Tamluk	40.5066	148.7766	0	15.3133	33.3825	83.75	0	8.93	43.4533	154.663
WBIIDC	40.37	115.4433	0	14.7033	32.2875	43.2725	0	8.505	38.152	127.5

Table No: 7 Different Air Pollution & Status 2022

STATION	2022									
	pre monsoon				during monsoon				post monsoon	
	NO2	PM10	PM2.5	SO2	NO2	PM10	PM2.5	SO2	NO2	PM10
Bhawanipur	39.2766	123.33	0	16.3333	40.5933	68.335	0	7.7725	36.234	110.93
Bhuniarachak	39.9333	131.78	0	14.6566	29.8525	66.1675	0	7.5725	36.74	123.4
Supermarket	39.1866	133.4433	77.3333	15.0266	31.2025	75.75	30.5	8.27	36.286	118.66
Tamluk	40.0733	162.3333	0	15.7366	32.275	80	0	8.6975	40.1233	143.99
WBIIDC	39.27	125.22	0	15.6766	30.975	69.25	0	7.8225	35.3	114.86

Table No: 8 Noise Exposure Index

SL NO.	LAT	LONG	NOISE LEVEL IN dB	PERMISSABLE LIMIT IN dB	NEI
1					
2	22.08143	88.15517	69.1	75	0.921
3	22.12033	88.13096	73.4	55	1.334
4	22.05267	88.08744	83.7	75	1.116
5	22.06668	88.13448	63	65	0.969
6	22.0566	88.08536	82	75	1.093
7	22.08053	88.13922	68.4	65	1.052
8	22.06267	88.08348	78.1	75	1.041
9	22.04469	88.06565	59.3	55	1.078
10	22.0578	88.1047	73.6	75	0.981

APPENDIX 2
QUESTIONNAIRE

OBJECTIVE: Environmental degradation and its Impact on Human Health and Biota-

A case study in Haldia, East Medinipur

Name:

Gender:

Age:

Occupation:

Place:

Family member:

Age	Male	Female	Total
<18			
18-60			
>60			

➤ You and your family member suffering from any type of Industrial pollution?

Yes ☐ No ☐

➤ What type of pollution are you suffered?

1. Water pollution ☐

2. Air pollution ☐

3. Noise pollution ☐

4. Soil pollution ☐

➤ Your family member have any type of disease?

Yes ☐ No ☐

➤ If there is any disease then what is it?

Ans:

➤ Is any member of your family involved in any industrial work?

Yes ☐ No ☐

➤ If he is involved then what kind of job is it?

Ans:

➤ What is the main cause of pollution in your area?

1. Transport

☐

	2. Industry	☐
	3. Garbage dumping	☐
	4. Drainage water	☐
➤	The local govt./Administration body to take any steps to control pollution?	
	Yes ☐	No ☐
➤	You and your family member have any eyes irritation problem	
	Yes ☐	No ☐
➤	You and your family member have any black foot disease?	
	Yes ☐	No ☐
➤	If yes number of people effected these diseases?	
	Less than 2	☐
	2-4	☐
	More than 4	☐
➤	You and your family member have eye problem?	
	Yes ☐	No ☐
➤	If so, what is the problem?	
	1. Very minor	☐
	2. Minor	☐
	3. Moderate	☐
	4. High	☐
	5. Very high	☐
➤	Do you have any kind of farming here?	
	Yes ☐	No ☐
➤	If yes what type farming?	
	1. Rice	☐
	2. Vegetable	☐
	3. Othe	☐