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AIR POLLUTION AND ITS IMPACT ON ENVIRONMENT: A STUDY IN HALDIA INDUSTRIAL REGION

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Abstract

The atmosphere is a gaseous envelope which surrounds the earth and air is a mixture of gases in varying amounts. The clean air consists of 78% nitrojen,21% oxygen,0.93% argon, 0.03% carbon dioxide and hydrogen and other inert gases to the extent of about 0.04%. Air becomes damaging to nature and human health when there is an excess of polluting elements in it. Air pollution occurs when gases, dust particles, fumes (or smoke) or odor are introduced into the atmosphere in a way that makes it harmful to humans, animals and plant. Air Pollution is caused due to introduction of harmful materials, biological molecules, into the atmosphere resulting in damage to living organisms, as a threat to animal kingdom, polluting in the atmosphere and thus degrading human health and the ecosystem. Air pollution can result from both human and natural actions. The causes of air pollution are urbanization, industrialization, motorization energy production from thermal plants, burning of domestic fuel, burning of agricultural waste and growth of urban settlement. Air pollution threatens the health of humans and other living beings in our planet. It creates smog and acid rain, causes cancer and respiratory diseases, reduces the ozone layer atmosphere and contributes to global warming. In this industrial region, air pollution cannot be eliminated completely, but steps can be taken to reduce it. The government has developed, and continues to develop, guidelines for air quality and ordinances to restrict emissions in an effort to control air pollution. On an individual level, we can reduce our contribution to the pollution problem by carpooling or using public transportation. Additionally, buying energy-efficient light bulbs and appliances or otherwise reducing our electricity use will reduce the pollutants released in the production of electricity, which creates the majority of industrial air pollution.

Keyword: Air Pollution, Causes, Impact, Prevention.

Introduction

The atmosphere is a gaseous envelope which surrounds the earth and air is a mixture of gases in varying amounts. The clean air consists of 78% nitrojen,21% oxygen,0.93% argon, 0.03% carbon dioxide and hydrogen and other inert gases to the extent of about 0.04%. Air becomes damaging to nature and human health when there is an excess of polluting elements in it. Whenever the proportion of the components of air is disturbed by man that becomes a cause of air pollution which has become an important factor of environmental degradation all over the world **(S.Kumar and P K De2010)**

Air Pollution is caused due to introduction of harmful materials, biological molecules, into the atmosphere resulting in damage to living organisms, as a threat to animal kingdom, polluting in the atmosphere and thus degrading human health and the ecosystem. Especially urban air quality gradually becomes worst due to toxic pollutant of air which increases in beginning of the 20th century with the development of transportation systems, large scale use of petrol and diesel and also development of industries.

DEFINITION OF AIR POLLUTION

Air pollution may be defined as the disequilibrium condition of air cause due to introduction of foreign elements from natural as well as anthropogenic sources to the air so that the air becomes injurious to the biological communities in general and human community in particular **(S.Kumar and P K De2010)**

Air pollution can be defined as an alteration of air quality that can be characterized by measurements of chemical, biological or physical pollutants in the air. Therefore, air pollution means the undesirable presence of impurities or the abnormal rise in the proportion of some constituents of the atmosphere.

Air pollution can be defined as the contamination of the atmosphere with anomalous concentration of substances that are harmful to the health of human being and other organisms. Typical example of air pollutants includes sulphur dioxide, carbon monoxide, nitrous oxides, ammonia, CFC and methane.

Air pollution is a serious environment concern since it can cause several disease in human being some even resulting in death. Therefore, the prevention of air pollution is very important.

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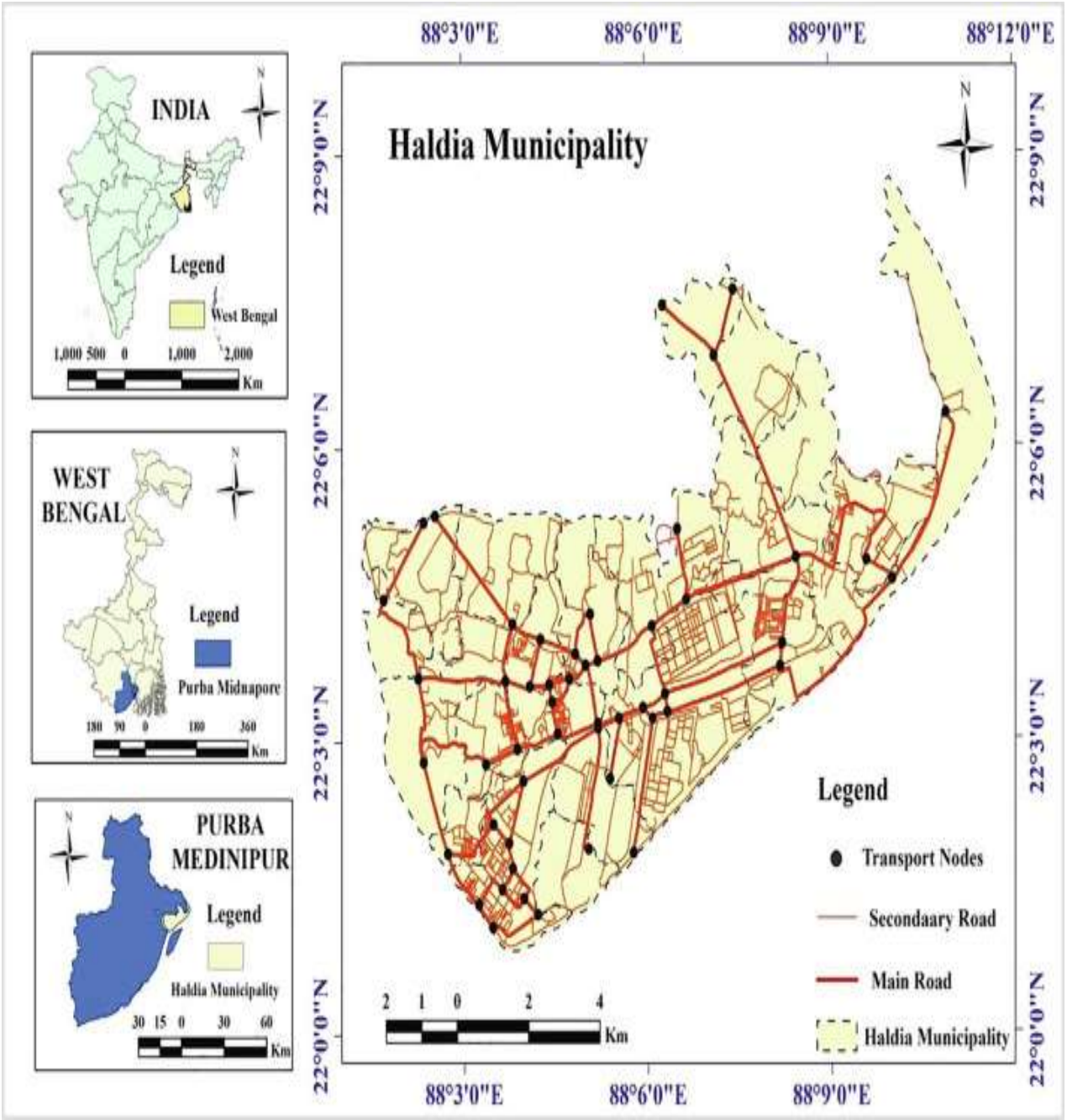
Air pollution is also known to have an adverse impact on a wide spectrum of life forms including crops and animals. It can be noted that air pollution can occur due to natural processes or human, the letter being more predominant (air pollution caused by human activity is generally referred to as anthropogenic air pollution).

Location Map of the Study Area



LOCATION OF HALDIA INDUSTRIAL REGION

Haldia industrial region is located at 22.0627°N, 88.0833°E. It was developed in 1977 in the district of Purba Midnapur of West Bengal. It is developed in a linear stretch with railway line running parallel to the road. It has a major port located 145 kilometres southwest of Calcutta near the transition of the Hooghly River to Bay of Bengal.

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OBJECTIVES OF THIS STUDY

To find out the objectives of the project work are given below.

1. To find out the nature of environmental degradation in this region.
2. To know the causes of environmental degradation in this region.
3. To know about the impact of air pollution in this environment.
4. To analyses the adverse effect on society caused by industrialization in this region.

HYPOTHESIS

Hypothesis of the project work are

1) The chemical industries are most responsible for air pollution in this area.
2) Due to the air pollution the environment and human health in this area are being severely damaged.
3) Air pollution are destroying the ecological balance of this region.

DIFFERENT INDUSTRY AND THEIR AIR POLLUTION IN HALDIA INDUSTRIAL REGION

Haldia is being developed in to a major trade port for Eastern India. The city has several important industrial factories such as: **i) Indian oil corporation ltd ii) south Asian petro-chemicals iii) Exide iv) Haldia petro-chemicals v) Tata chemicals etc. etc.**

Different Industries and their pollutant

1) Nitric Acid – NOx
2) Oil Refiner - oil, grease, phenol, sulphide, BOD'
3) Sugar Mills- BOD
4) Atomic Energy Plants - Temperature, Zinc, Oil, grease, iron, chromium, phosphate
5) Electro Planting - Temperature, Zinc, Oil, grease, lead, chromium, phosphate, Nitrogen
6) Petro-Chemical - Hydrocarbons, Phenol, Sulphide, COD, Cyanide, flurried, chromium
7) Chemical hub (Fertilizers) - Nitrogen, Cyanide, DDT, methyl, Oil, grease, lead, vanadium, arsenic, copper phosphate, sulphide, sulphate
8) Paper mill - Free Chlorine

HPL

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EXIDE

EMAMI

ADANI

MITSUBISHI

RUCHI

Tata chemicals

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Industries Name	*Product*
Indian oil corporation in Haldia	Oil refinery
South Asian Petrochemicals Ltd.	Naphtha, chemicals
Emami Agrotech LTD	Edible oil, Biodiesel power
Exide Industries in Haldia	Battery
Tata Chemicals Ltd in Haldia	Industrial Phosphate & Acids.
Indian Oil Petronas in Haldia	L.P.G.
Shimon Ispat Ltd in Haldia	Steel rolling
Greenways Shipping Agencies Pvt Ltd. In Haldia	Containers Freight Station (CFS)
Swale Corporation Ltd in Haldia	Dimethanate, Fenithrothion, Ethion, Malathion.
Adani Wilmar Ltd.	Edible oil
Future Industrial Projects in Haldia	Oil refinery, sugar, soya charm
India Power Corporation (Haldia) Ltd.	Power
Haldia Energy Ltd.	Power
Sino steel Rolls India Pvt. Ltd.	Steel rolling
Ruchi Infrastructure Pvt. Ltd.	3RD Party liquid storage tank terminal
Ruchi Sova Industries Ltd	Edible oil
Dhunseri Petrochemical Tea Ltd	Polyethylene, Terephthalate
JVL Oil Refinery	Oil refinery
Bharat Petroleum Corporation Ltd., Haldia	Petroleum and allied products
Hindustan Petroleum Corporation Ltd.	Petroleum and allied products
Shree Renuka sugars Ltd.	Sugar Refinery and Food Complex
Sanjana Cryogenic Storages Ltd	Ammonia Storage and handling terminal

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Table-1. Air pollution in Haldia (22.06.2021)

Pollutants	*Concentration*
PM 2.5	27 µg/m³
PM 10	52 µg/m³
O3	43 µg/m³
NO2	17.3 µg/m³
SO2	9 µg/m³
CO	0.5 µg/m³

Table-2. Air pollution in Haldia S A P ltd

Pollutants	Concentration
PM 2.5	8.9µg/m³
PM 10	19.6µg/m³
O3	45.8 µg/m³
NO2	12.5 µg/m³
CO	12.1 µg/m³

Table-3. Air pollution Haldia for IOCL Haldia (23.05.2021)

Pollutants	*Concentration*
PM 2.5	33 µg/m³
PM 10	51.6 µg/m³
O3	45.9 µg/m³
NO2	20 µg/m³
SO2	33.6 µg/m³
CO	997.3 µg/m³

Source-Field Survey


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CAUSES OF AIR POLLUTION IN HALDIA INDUSTRIAL REGION

Air pollution can result from both human and natural actions. The causes of air pollution are urbanization, industrialization, motorization energy production from thermal plants, burning of domestic fuel, burning of agricultural waste and growth of urban settlement. Rapid urbanization is one of the most important causes of air pollution the pollution in cities is known to a arise a large extent from incorrect fuel burning techniques, poor fuel quality, dearth to green areas, increase in the number of motor vehicles inadequate disposal of wastes.

The rapid rate of industrialization has resulted in more and more air pollutions. Various industrial processes release almost all types of pollutants in the air. Some industries like cement, fertilizer, and petro chemical are of great concern because of the difficulty in controlling the emission of pollutants from them. It is estimated that 50-60% of the total air pollution is shared by running in motor vecheils in the Haldia cities. This is because of inferior quality of fuel material, out dated engines and over loading of motor vecheils. The spray of pesticides in agriculture is responsible for air pollution in rural areas. **(S.Kumar and P K De2010)**

The following are the main reasons for the increasing rate of air pollution

1. **Unplanned Industrial Growth**: -In most industrial townships, unplanned growth took place wherein those companies flouted rules and norms and polluted the environment with both air and water pollution.
2. **Use of old dated Technologies:** -Most industries still apply old technologies to produce products that generate a large amount of waste. To avoid high cost and expenditure, many companies still make use of traditional technologies to produce high-end products.
3. **Growth of a Large Number of Small-Scale Industries:** -Now a day's many small-scale industries and factories that don't have enough capital and no government grants to run their day-to-day businesses often escape environment regulations and release a large number of toxic gases in the atmosphere.
4. **Inefficient Waste Disposal:** -Water pollution and soil pollution are often caused directly due to inefficiency in the disposal of waste. Long term exposure to polluted air and water causes chronic health problems, making the issue of industrial pollution into a severe one. It also lowers the air quality in surrounding areas, which causes many respiratory disorders.
5. **Lack of Policies to Control Pollution:** -Lack of effective policies and poor enforcement drive allowed many industries to bypass laws made by the pollution control board, which resulted in mass-scale pollution that affected the lives of many people
6. **Leaching of Resources from Our Natural World:** - Industries do require a large amount of raw material to make them into finished products. This requires the extraction of minerals from beneath the earth. The extracted minerals can cause soil pollution when spilled on the earth. Leaks from vessels can cause oil spills that may prove harmful to marine life.
7. **Natural Resource Use:** - One of the most common forms of leaching from natural resources is fracking for oil. When industries extract minerals, the process causes soil pollution and also causes oil leaks and spills that are harmful and even deadly to people and animals.

IMPACT OF AIR POLLUTION IN HALDIA INDUSTRIAL REGION

The effect of air pollution may be grouped in four broad categories,

1. **Effects on weather and climate**

Some of the effects of air pollution on atmospheric conditions are given below

a) Depletion of ozone causes by CFCS emitted from air conditioners, refresiserter, hair driers spray can dispensaries, fire extinguisher etc.
b) Green house effect of the atmosphere caused due to increased concentration of carbon dioxide, methane, CFCs, ozone, nitrous oxide, water vapour etc.
c) In urban areas smog is formed when fog is mixed with smoke. When smog is mixed with sulphur dioxide, oxides of nitrogen and ozone, it becomes poisonous.
d) Visibility is reduced.
e) Fall of acids and acid forming compounds from the atmosphere to the earth's surface. This is called acid rain. It is caused when SO_2 and NO_2 mixed with atmospheric water to from sulphuric acid (H_2SO_4) and nitric acid (N_2NO_3)

2. **Effects on human health:** Air pollution mainly affects the respiratory system. Bronchitis, asthma and lung cancer are some of the chronic diseases caused due to exposure to pollute air. Sulphur dioxide is considered to cause cough, shortness of breath and acute irritation to the membrannces of the eyes. Sulphur dioxide also acts as an allergenic agent. When SO_2 reacts with some compounds, sulphuric acid is formed which may damage lungs. Carbon monoxide often affects the oxygen carrying capacity of blood. Excess concentration of nitric oxide may cause pulmonary haemorrhage. Depletion of ozone may cause skin cancer mainly among the white people because of exposure to ultra-violet solar radiation. Urban smog's block the respiratory system of human bodies and cause deaths of human beings.

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3. **Effects on plants and animals:** Air pollution has caused widespread damage to vegetation. When the absorption of sulphur dioxide exceeds a particular level, the call becomes inactive and is killed; resulting is tissue collapse and drying of leaves. Fluorides and smog are responsible for serious injuries to plants. Chlorines, ammonia, hydrogen sulphide are also harmful to plants. Depletion of ozone results in increase ultra violet solar radiation reaching the earth's surface. The U V rays adversely affect plant and animal communities in a variety of ways: photosynthesis, water use efficiency and yield of plants are reduced. The impact of air pollution on animals is more or less similar to that of effect on man.
4. **Water pollution:** The effects of industrial air pollution are far-reaching and liable to affect the ecosystem for many years to come. Most industries require large amounts of water for their work. When they involved in a series of processes, the water comes into contact with heavy metals, harmful chemicals, radioactive waste, and even organic sludge. These are either dumped into open oceans or rivers. As a result, many of our water sources have a high amount of industrial waste in them, which seriously impacts the health of our ecosystem. The same water is then used by farmers for irrigation purposes, which affects the quality of food that is produced. Water pollution has already rendered many groundwater resources useless for humans and wildlife. It can at best be recycled for further usage in industries.
5. **Soil pollution:** It is creating problems in agriculture and destroying local vegetation. It also causes chronic health issues to the people that come in contact with such soil on a daily basis.
6. **Wildlife Extinction:** By and large, the issue of industrial pollution shows us that it causes natural rhythms and patterns to fail, meaning that the wildlife is getting affected in a severe manner. Habitats are being lost, species are becoming extinct, and it is harder for the environment to recover from each natural disaster. Major industrial accidents like oil spills, fires, the leakage of radioactive materials and damage to property are harder to clean-up as they have a higher impact in a shorter timeframe.
7. **Global Warming:** With the rise in industrial pollution, global warming has been increasing at a steady pace. Smoke and greenhouse gases are being released by industries into the air, which causes an increase in global warming. Melting of glaciers, extinction of polar bears, floods, tsunamis, hurricanes are few of the effects of global warming.
8. **Other effects**: Air pollution is responsible for damage to property and materials. The smoke, dust and oxide of sulphur have harmful effect on structure. SO_2 is the most damaging of all gaseous pollutants.

PREVENTION AND MANAGEMENT OF AIR POLLUTION IN HALDIA INDUSTRIAL REGION

The issue of industrial pollution is critical to every nation on the planet. With the increase of the harmful effects of industrial pollution, there are many agencies and individuals who are working to reduce carbon footprints and live and work in an eco-friendly way. However, industrial pollution is still rampant and will take many years for proper control and regulation.

1. Source Control: Adopting new technology, efficient training of employees for safe use and development of better technology for disposal of waste, and being more conscientious about the use of raw materials can help control industrial pollution at the source.

2. **Recycling:** Recycling as much polluted water in the industries as possible by increased recycling efforts to reduce industrial pollution.

3. Cleaning of Resources: Organic methods should be adopted to clean the water and soil, such as using microbes that use heavy metals and waste as feed naturally. Cooling rooms or bins need to be developed that allow industries to recycle the water they need instead of pushing it back into the natural water source it came from

4. Industry Site Selection: Consideration of location of the sites and the potential impact on the surrounding environment can help reduce harmful consequences.

5. Proper Treatment of Industrial Waste: By developing and implementing adequate treatment facilities for handling industrial waste and proper habits can reduce pollution.

6. Rebuilding Habitats and Afforestation: Rebuilding habitats by planting more trees and plants can help give wildlife back their homes, and the trees can help purify the air with enough oxygen, and act as a buffer against the environment.

7. Stricter Laws and Enforcement: The Environmental Protection Agency (EPA) works to correct the damage from industrial pollution. There should be more stringent rules to take action against the companies who do not follow proper protocol and more significant rewards for the companies who operate properly. It requires creating policies that prevent misuse of land.

Govt. and Public Awareness to Prevent the Air Pollution of this Region

Urgent actions are required to help reduce air pollution in Haldia, one of the most polluted cities in the world, and restore various air parameters to levels safe for the health of its citizens and visitors. Here are few steps that can play an instrumental role in reducing air pollution in Haldia, which reached alarming levels of 485 AQI (air quality index), when the safe limit for humans is less than 100 AQI.

1**. Carpooling:** Reduce traffic-based air pollution and congestion by starting car pool lanes for those cars and four wheelers that have three or more passengers to encourage people to go for carpooling. Meanwhile, citizens too should take initiative and car pool with friends, colleagues, family wherever possible.

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2. **Use bicycles:** Mark out bicycle lanes in residential colonies as well as on all roads in Haldia to encourage safe travel by bicycles. Meanwhile, citizens should also be encouraged to use bicycles.
3. **Public transport:** Encourage greater use of public transport by supporting the Metro, overhead rail and bus services to make it convenient for people to travel by public transport affordably and safely instead of using their own vehicles. Citizens too must shed hang-ups over social status and try to travel by public transport proactively.
4. **More CNG vehicles:** Encourage use of CNG in motor vehicles as it is a much cleaner fuel than petrol or diesel by considerably reducing the road tax and sales tax on CNG filled cars as compared to petrol and diesel four wheelers. Since there are at least 1,400 cars added to Haldia roads every day, all the cars should be restricted to using CNG only as all new petrol cars can be converted to CNG. Also, new registrations should be discouraged by enhancing registration charges.
5. **Fuel-efficient cars:** Encourage more fuel efficient four wheelers with better mileage per liter through road tax and sales tax incentives in addition to CNG requirement. Citizens should opt for more efficient and smaller cars that can run on CNG as alternate fuel.
6. **Bigger trucks:** Encourage six-axle trucks rather than the typical four-axle ones to increase the pay load per truck to reduce the number of trucks on roads. Trucks going to other destinations must not be allowed to pass through Delhi and only use the bypass.
7. **Road signs:** Improve the poor road signs so that people do not travel extra to locate their destinations. All the signs must be signposted at two or three places well before the turning rather than at the last minute.
8. **Maintenance of roads**: Better maintain roads to complexes such as Nehru Place to reduce the time a four wheeler spends on plying on such poor roads.
9. **Shared taxis:** The transport department should encourage shared taxi services by developing a taxi sharing website and set up taxi stands and cabs to offer reduced fares for shared service. This is other than the facilities Ola and Uber provide.
10. **Burning waste:** Burning of leaves, old tyres or any items in the open should be made a punishable offence in NCR with a fine of Rs 10,000 per incident as this is a major cause of air pollution. Citizens should be asked to report such incidents to helpline numbers and emails.
11. **Solar power:** Installation of solar panels should be encouraged at homes, multi-store buildings and commercial establishments so that decentralized power is generated with suitable subsidies to make it financially viable for all households. The cost of solar panels has come down considerably. This should help retire all coal-based thermal power plants which are adding a lot to Haldia's air pollution problems and adversely effecting climate change. In fact, thermal power plants in Haldia -NCR should be stopped from functioning till the AQI level is under 200.
12. **Power backup:** Inverters should be encouraged for back up supply and diesel generator sets should not be allowed to run in Haldia -NCR till the AQI level comes below 200.
13. **Dump sites:** Landfills should be better managed by the government to ensure there are no fires there.

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