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Study of Air quality and Air pollution

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Abstract
A considerable number of Indian towns, including Rohtak, which is situated in the state of Haryana, are plagued by serious issues related to air pollution. Rohtak is one of these cities. The majority of Rohtak's air pollution can be traced back to a confluence of elements, the most prominent of which are emissions from industry, automobile traffic, and agricultural practises. The statistics provided by the Central Pollution Control Board (CPCB) indicate that Rohtak has a typically bad air quality, with an average Air Quality Index (AQI) that ranges from Unhealthy to Very Unhealthy during the course of the year. It is possible for the Air Quality Index (AQI) in Rohtak to reach Severe levels during the winter months, which may have a negative impact on the health of the people who live there. The administration of Rohtak has taken a number of steps to address the issue of air pollution in the city. These steps include the deployment of buses powered by compressed natural gas (CNG) and the shutting down of companies that contribute to air pollution. Using public transportation, carpooling, and cutting down on energy use at home are some of the efforts that people may take to cut down on the amount of pollution that they are responsible for contributing to the environment.

Keywords : Rohtak, Air pollution, Vehicular traffic, Industrial emissions, Agricultural activities, Central Pollution Control Board (CPCB)

Introduction

The city of Rohtak can be found in the state of Haryana in India. It is well-known for its extensive cultural history, as well as its educational institutions and rapidly expanding industrial and agricultural sectors. However, similar to a large number of India's other major areas, Rohtak is also struggling with serious issues related to air pollution. Vehicle traffic, industrial emissions, and agricultural activities are some of the many contributors to air pollution in Rohtak, which has a varied range of sources. The Central Pollution Control Board (CPCB) is responsible for monitoring the air quality in the city. Throughout the course of the year, the CPCB has stated that the air quality in Rohtak has been bad, with an Air Quality Index (AQI) that ranges from Unhealthy to Very Unhealthy. It is possible for the Air Quality Index (AQI) in Rohtak to reach Severe levels during the winter months, which may have a negative impact on the health of the people who live there. The administration of Rohtak has been forced to respond to the city's alarmingly high levels of air pollution by implementing a variety of countermeasures. Among these measures are the discontinuation of polluting businesses, the establishment of more stringent environmental rules, and the use of buses powered by compressed natural gas (CNG), which may cut emissions from vehicles. Individuals can play a significant role in the reduction of air pollution in Rohtak by adopting sustainable practises such as using public transportation, carpooling, and reducing energy consumption at home.

Although the efforts of the government are essential, individuals can also play a significant role in the reduction of air pollution in Rohtak. The battle against air pollution in Rohtak needs the concerted efforts of all parties involved, including the government, industry, and individual residents. This is necessary in order to maintain a clean and healthy atmosphere for all people. The negative effects of air pollution on human health have been studied extensively, and the residents of Rohtak are not exempt from these consequences. "The development of respiratory and cardiovascular illnesses, the exacerbation of preexisting health disorders, and even mortality at an earlier age may be attributed to prolonged exposure to high levels of air pollution. Children, the elderly, and those who already have health problems are at a greater risk of experiencing unfavourable consequences as a direct result of exposure to air pollution. In addition to its negative impacts on human health, air pollution also has adverse repercussions on the economy and the environment. A decline in air quality may result in a loss of biodiversity, damage to infrastructure, and a reduction in agricultural output. In addition, there is a significant financial burden associated with air pollution, which includes higher expenditures for medical treatment, decreased job productivity, and diminished tourist numbers. In order to solve the problem of Rohtak's severe air pollution, there is a need for a strategy that is both all-encompassing and well-coordinated, and it must engage all relevant parties. In addition to making investments in technology that produce less pollution, the government must continue to enforce and bolster the already existing environmental legislation. The manufacturing sector has to take responsibility for lowering its emissions and implementing more environmentally friendly methods. And people may make a difference by reducing their own carbon footprint by instituting subtle but significant lifestyle adjustments in their day-to-day routines. Air pollution is a critical problem in Rohtak, and all parties involved need to pay rapid attention to the situation and take appropriate action. To guarantee that Rohtak will have a future that is cleaner, healthier, and more successful, its citizens, officials, and companies must collaborate to develop long-term solutions to this challenge.

Cities throughout the globe that are experiencing rapid population growth and increased vehicle traffic face a significant challenge in the form of increased air pollution. Problems with human and animal health, as well as harm to ecosystems, are brought on by the pollutants that are discharged. The horizontal and vertical movement of air has an effect on the contaminants, and physical processes such as winds and atmospheric lapse rates are responsible for this effect. The dispersal of the contaminants, which is caused by wind, is what ultimately leads to their dilution. Pollutants tend to condense closer to the earth's surface when conditions such as temperature inversions and air stagnation prevail. Because of the high population density and the sluggish flow of cars, business districts and intersections with red lights have been shown to have very high levels of air pollution. Aside from the purely physical processes, plants also have the potential to play a significant role in the reduction of pollutants in the surrounding environment. By virtue of their physiological processes, plants are able to eliminate a significant portion of the airborne contaminants that are present. Plants have huge surface areas, which allow them capture various air pollutants either directly via absorption or adsorption processes, or indirectly through deposition on the biologically active leaf surface area. This may be accomplished in a few different ways. Bacteria populate the surfaces of leaves, and it

has been shown that these microorganisms are responsible for the breakdown of a variety of organic contaminants. After being subjected to air pollution, plants will display alterations in their physiology, which will then be followed by observable damage. Plants are complicated organisms, and their physiological responses are dependent on a variety of criteria and conditions, any of which may be altered by pollution. The air pollution has the least impact on species that are tolerant of its effects, while the most damage is done to species that are susceptible to it.

The Air Pollution Tolerance Index (APTI) was used in order to evaluate whether or not the plant is suitable for usage in a location with high levels of air pollution. The APTI is calculated using the quantities of ascorbic acid, chlorophyll, relative water content, and pH in the leaf extract. These are the four biochemical factors that make up the calculation. Ascorbic acid is an essential reducing agent, and it protects plants against the cytotoxic effects of free radicals generated by oxidative gases such as NOx, SOx, and other similar compounds. The production of the cell wall, cell division, and defence are all directly tied to the development and upkeep of the plant, and ascorbic acid plays an important role in all three of these processes. There is a correlation between the amount of chlorophyll present and the amount of photosynthetic activity, which leads to growth and the buildup of biomass. The deterioration of the photosynthetic pigment is an indication that may be utilised for measuring air pollution. It is possible that a high pH is responsible for the effective conversion of hexose sugar to ascorbic acid. The presence of acidic pollutants in the surrounding air causes a decrease in the ph of the leaf. Plants with a low pH have been shown to have decreased rates of photosynthesis. A high water content in plants is indicative of their tolerance to drought and assists in maintaining the physiological functioning under stressful situations brought on by exposure to air pollution. Therefore, these four characteristics have been used in order to evaluate the amount of tolerance that plants have for air contaminants. Results that are comparable have been reported regarding the degree to which plants are susceptible to air pollution, as indicated by their APTI values, as well as the plant responses found in controlled and field trials. The higher the index value, the more resistant to environmental toxins the plant will be. This index provides a dependable way for screening plants according to the degree to which they are sensitive or tolerant to a given substance. The APTI is used by landscape designers to choose tolerant plant species that have the potential to function as natural sinks for gas pollution.

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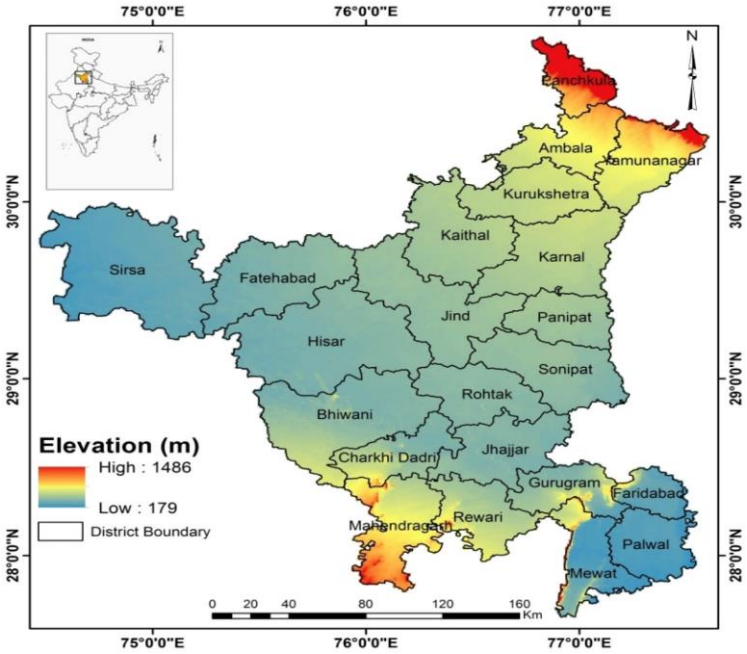
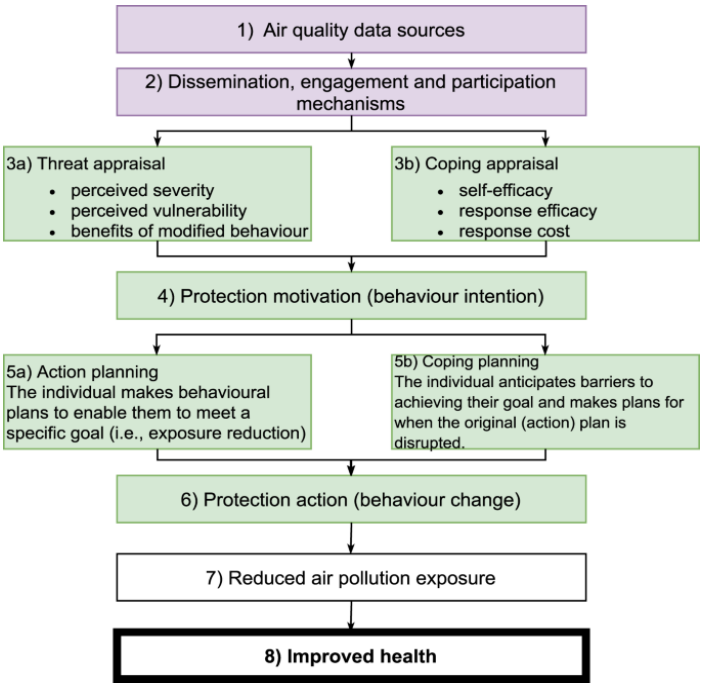


Data from classic static monitoring stations are used to analyse and evaluate policies about air quality. These stations are subjected to stringent calibration and maintenance procedures in order to guarantee that their output data are extremely accurate, exact, and comparable. However, the outdoor static monitoring network does not represent individuals' exposure and is not designed to provide information about indoor exposures or to support the personalization of air quality data (which would allow individuals to measure their own exposures based on their individual behaviour and time-activity patterns). Instead, it only monitors the air quality outside. Recent developments in sensor technology have led to sensors with lower prices and variable levels of quality". These sensors are supplementing the static infrastructure in many different contexts, and in some instances, they are the only viable monitoring option due to economic, infrastructural, or political factors. Even while these sensors may be used to measure air quality in either an indoor or an outdoor setting, many of them can also be worn by an individual in order to monitor their own personal exposure to a certain substance. It is impossible to generalise about a person's exposure to air pollution since it is determined by a wide variety of characteristics, some of which include a person's geographical location, time-activity patterns, profession, gender, and socioeconomic level. The individualization of data on air quality in this way may be helpful in the process of developing and carrying out strategies to cut down on exposures. One of the individual action techniques that is advised for reducing the health risk associated with air pollution is consulting air pollution levels (using data from either static monitoring or personal monitors). However, in order for this to be possible, data on the quality of the air must be made readily available and easily accessible. Furthermore, in order for this to have an effect on individual behaviour, people must be able to understand the information that is presented to them. In addition, exposure to air pollution is both ecologically and socially complicated, making it a wicked issue. Since a cocktail of air pollution is produced by a variety of sources, there is no one right method or definitive action plan that may minimise exposures. Taking on the challenge of reducing one's exposure to air pollution

necessitates multidisciplinary, cooperative, and creative techniques geared toward achieving a shared objective. This challenge extends beyond the realms of environmental science, health psychology, and public health. The participation of multiple stakeholders, such as governments, institutions, academic institutions, and civil society, is an essential component of this. The participation of civil society, in particular, is essential to the formulation of multiple solutions and action strategies that are acceptable to the general public and are feasible to implement.



Source : "A multistage process to improve air pollution-related health. For air quality data to influence exposure reduction for improved public health requires a multistage process comprising of external (purple) and internal (green) factors. Internal factors are integrated into the process through (adapted) Protection Motivation.

Review of literature

(Shukla, Dalal, and Chaudhry 2010) studied Impact of vehicular exhaust on ambient air quality of Rohtak city, India discovered this and Using a High Volume Sampler, this research looked at the air quality in the ambient air of Rohtak city, which is located in Haryana. The levels of sulphur dioxide (SO2), nitrogen dioxide (NO2), ozone (O3), and suspended particle materials (SPM) were chosen as the criteria to evaluate the air's quality because they provide an accurate representation of the pollution load that is carried by the air. The data for the monitoring were gathered from six different randomly chosen locations inside the city of Rohtak. At each of the locations, levels of sulphur dioxide were measured and found to be far below the maximum levels allowed by the National Ambient Air Quality Standards (NAAQS). The levels of sulphur dioxide (SO2) were found to be much higher throughout the winter months compared to the summer and monsoon seasons. At four different locations throughout the winter season, the concentration of nitrogen dioxide was found to be higher than what is permitted by the NAAQS

requirements. The measured levels of ozone were found to be below the specified standards (NAAQS), although the measured levels of ozone were found to be greater during the summer months as compared to the winter months. At every location and throughout each of the three seasons, the concentration of suspended particulate matter was found to be higher than the permissible levels.

(Deswal et al. 2019) studied an assessment of anticipated pollution index of some common plants and trees of rohtak city of haryana (India) discovered this and Cities throughout the globe that are experiencing rapid population growth and increased vehicle traffic face a significant challenge in the form of increased air pollution. Problems with human and animal health, as well as harm to ecosystems, are brought on by the pollutants that are discharged. The horizontal and vertical movement of air has an effect on the contaminants, and physical processes such as winds and atmospheric lapse rates are responsible for this effect. The dispersal of the contaminants, which is caused by wind, is what ultimately leads to their dilution. Pollutants tend to condense closer to the earth's surface when conditions such as temperature inversions and air stagnation prevail. Because of the high population density and the sluggish flow of cars, business districts and intersections with red lights have been shown to have very high levels of air pollution. Aside from the purely physical processes, plants also have the potential to play a significant role in the reduction of pollutants in the surrounding environment. By virtue of their physiological processes, plants are able to eliminate a significant portion of the airborne contaminants that are present. Plants have huge surface areas, which allow them capture various air pollutants either directly via absorption or adsorption processes, or indirectly through deposition on the biologically active leaf surface area. This may be accomplished in a few different ways. Microorganisms3 populate the surfaces of leaves, and it has been shown that these microbes are responsible for the breakdown of a variety of organic pollutants.

(Singh, Nanda, and Dahiya 2022) studied State of air pollutants and related health risk over Haryana India as viewed from satellite platform in COVID-19 lockdown scenario discovered this and Intense human activity on earth like as transportation, industrialisation, and the burning of biomass are the primary contributors to air pollution. Natural causes such as volcanic eruptions and forest fires also have a role. It has been estimated that human activities are responsible for around 80 percent of the growth in pollution. Therefore, a reduction in human activity would have led to a decrease in the amount of air pollution, which was witnessed at the global and regional level during the COVID-19 driven lockdown in the year 2020. The socioeconomic and environmental situations of planet earth have been substantially altered as a direct result of COVID-19. COVID-19 is a respiratory illness that has a viral origin and is caused by a new coronavirus or SARS CoV-2. The symptoms of COVID-19 include a dry cough, fever, and trouble breathing. In December 2019, the first instance of COVID-19 was identified in Wuhan city, China. The virus quickly spread all over the world after its first discovery. Due of the ease with which it might spread and the number of people it kills, the World Health Organization (WHO) decided on March 11, 2020 to classify it as a pandemic over the whole world.

(McCarron et al. 2022) studied Public engagement with air quality data: using health behaviour change theory to support exposure-minimising behaviours discovered this and Every year, 7 million individuals throughout the world lose their lives prematurely due to the effects of air pollution. Policy interventions that aim to decrease emissions of pollutants, enhance ambient air quality, and thereby minimise health consequences may be beneficial, but they often take a long time to have the desired effects. As a result, people's exposure to air pollution may be mitigated more quickly and effectively via the implementation of individual activities in addition to regulatory initiatives. Air quality indices, also known as AQIs, are used all over the world (albeit not everywhere), primarily in order to simplify the measurement of air quality by reducing it to a single unitless number that can then be linked with recommendations in order to inspire behavioural shifts. In this article, we examine, with specific reference to health behaviour theories, the reasons why they are typically inadequate to initiate change in an individual. We examine the health behaviour theoretical steps that link air quality data with reduced air pollution exposure and (as a consequence) improved public health. We argue that a combination of more personalised air quality data and greater public engagement with these data will together provide better support for individual action. On the basis of this, we present a novel framework that, when applied to the process of shaping interventions to improve air quality, has the potential to yield interventions that are more effective and sustainable in reducing individual exposures and, as a result, reducing the burden that air pollution places on the global public health.

Conclusion

To summarise, air pollution is a huge concern in Rohtak, and it has negative effects not only on people's health but also on the local economy and the environment. Because there are so many different contributors to air pollution, addressing the problem will need coordinated action from all relevant parties". There is still a significant amount of work to be done to guarantee that the residents of Rohtak are breathing in clean and healthy air despite the fact that the government has enacted many measures to address air pollution. In addition, individuals are responsible for a significant portion of the solution to the problem of air pollution. Individuals may do their part to promote a cleaner environment and limit the amount of pollution they contribute to the atmosphere by adopting sustainable behaviours such as utilising public transportation, carpooling, and lowering the amount of energy they use. Education and awareness campaigns have the potential to play a significant part in fostering a culture of environmental stewardship and motivating people and corporations to adopt preventative measures to lessen their impact on the environment. Getting a handle on the air pollution situation in Rohtak calls for a concerted effort from several parties and an integrated strategy that targets the factors that contribute to the problem, tightens up environmental legislation, and encourages environmentally responsible behaviour. Together, the residents of Rohtak can make their city a better place to live for themselves and for the generations to come by making it healthier, cleaner, and more affluent.

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