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A STUDY ON THE AIR QUALITY INDEX AWARENESS AND PEOPLE'S PARTICIPATION IN SUSTAINABILITY INITIATIVES

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Abstract:

Air pollution represents the greatest environmental risks to human health. Globally, an annual estimation of premature death due to air pollution is 7.9 to 8.1 million. The Air Quality Index awareness is important for protecting public health, enabling individuals to make decisions about outdoor activities to reduce exposure to harmful pollutants. The Government of India has launched several initiatives to create awareness about the Air Quality Index (AQI), aiming to help citizens understand pollution levels, associated health risks, and necessary precautions. Still the Air Quality Index of Navi Mumbai has been consistently higher since past ten years. This study aims to assess the level of Air Quality Index awareness among people and examine the relationship between AQI awareness and people's participation in sustainability initiatives. The paper adopted a cross-sectional survey study as research design. Online questionnaires were distributed among 85 respondents of Navi Mumbai area and data collected were analysed through descriptive statistics, Reliability Analysis and correlational analysis in social science research.

The study concludes that AQI awareness significantly influences sustainability participation. Enhancing public awareness can therefore contribute to improved environmental outcomes.

Keywords –. *Air pollution, Air Quality Index, AQI Pollutants, AQI Categories, AQI awareness, Sustainable initiatives.*

Introduction:

Air Pollution – Air pollution is the presence of substances (harmful gases, dust, and particulate matter) in the air resulting in poor air quality which are harmful to humans, other living beings or the environment.

Air Quality Index – The Air Quality Index (AQI) is a standardized, numerical, and color-coded tool used to measure and communicate the daily status of air quality status, specifically focusing on health effects that can occur within hours or days. It converts complex data from pollutants into a single, easy-to-understand index value, where higher values indicate greater pollution and increased health risks.

AQI Pollutants - AQI measures five or eight major pollutants, which includes PM_{10} (Particulate Matter with a diameter less than 10 micrometers), $PM_{2.5}$ (Particulate Matter with a diameter less than 2.5 micrometers), O_3

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(Ozone) ground-level, CO (Carbon Monoxide), NO_2 (Nitrogen Dioxide), SO_2 (Sulphur dioxide), NH_3 (Ammonia) and Pb (Lead). The highest sub-index of a pollutant determines the overall AQI for a location.

AQI Categories - The index is categorized into six levels: Good (0-50), Satisfactory (51-100), Moderately Polluted (101-200), Poor (201-300), Very Poor (301-400), and Severe (401-500).

AQI awareness – AQI awareness refers to people's understanding of the daily color-coded index (0-500+) used to communicate and measure outdoor air pollution levels and health risks associated with it.

Sustainable initiatives - Sustainable initiatives are planned practices taken by individuals, businesses, institutions, or governments aimed to protect the environment, preservation of resources and promoting long-term social and economic well—being.

Introduction:

Air pollution is considered as one of the greatest environmental concerns worldwide. It severely impacts human health by causing respiratory diseases (asthma, COPD), cardiovascular problems (heart attacks, strokes), cancers (lung), and neurological issues. In India air pollution causes approximately 1.6 to over 2 million deaths annually. India consistently ranks among the most air-polluted countries in the world, generally appearing in the top 3 to 5 most polluted nations globally.

The EPA(U.S. Environmental Protection Agency) as well as Indian standards calculate the AQI using five or eight major pollutants, which includes PM10 (Particulate Matter with a diameter less than 10 micrometers), PM2.5 (Particulate Matter with a diameter less than 2.5 micrometers), O3 (Ozone) ground-level, CO (Carbon Monoxide), NO2 (Nitrogen Dioxide), SO2 (Sulphur dioxide), NH3 (Ammonia) and Pb (Lead). These pollutants primarily originate from burning fossil fuels in vehicles and industries, waste burning, and agricultural practices. The World Air Quality Report 2024[1], released by Swiss company IQAir, ranked India as the 5th most polluted country globally. India is home to a significant number of the world's most polluted cities, with 6 of the top 10 and 13 of the top 20 most polluted cities often located in India, according to **Drishti IAS**. WHO air pollution guidelines states that, annual average of $PM_{2.5}$ level should be 5 µg/m3, whereas India has 50.6 µg/m3 which is more than 10 times higher than the WHO $PM_{2.5}$ annual guideline. Hence the Air Quality Index (AQI) is required in India to transform complex, daily air pollution data from multiple pollutants into a simple, color-coded, single-number index. It enables the public to quickly understand health risks, helps authorities track pollution trends, and facilitates the implementation of targeted, urgent air quality management policies to combat hazardous pollution levels.

The **WHO** sets evidence-based Air Quality Guidelines (AQG) to assist countries in protecting public health as different countries has different agencies and process of calculating AQI. Currently air quality information is presented to public via daily AQI which is a standardized, numerical, and color-coded tool used to measure and communicate the daily status of air quality status, specifically focusing on health effects that can occur within

[1] https://www.drishtiias.com/daily-updates/daily-news-analysis/world-air-quality-report-2024

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hours or days.

In India the national AQI was launched in New Delhi on 17th September, 2014, in New Delhi by the Ministry of Environment, Forest and Climate Change. It was introduced as part of the Swachh Bharat Abhiyan. The system was developed by an expert committee formed by the Central Pollution Control Board (CPCB), with technical inputs from IIT Kanpur. The proposed index has 6 categories with elegant colour scheme as follows:

CENTRAL POLLUTION CONTROL BOARD'S AIR QUALITY STANDARDS	
AIR QUALITY INDEX (AQI)	CATEGORY
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

Various Agencies and Systems for AQI Monitoring:

- Central Pollution Control Board (CPCB): The central statutory organization responsible for national ambient air quality standards and monitoring, using Continuous Ambient Air Quality Monitoring Stations (CAAQMS).
- State Pollution Control Boards (SPCBs) Responsible for tracking air quality at the state level.
- Pollution Control Committees (PCCs): It is a statutory authorities constituted by the Central Government, primarily for Union Territories and specific regions in India
- National Environmental Engineering Research Institute (NEERI): Involved in technical studies and monitoring, particularly in industrial and urban settings.
- System for Air Quality and Weather Forecasting and Research (SAFAR): Under the IMD, it provides AQI forecasts for major cities like Delhi, Mumbai, Pune, and Ahmedabad.
- Commission on Air Quality Management (CAQM): Focuses on the National Capital Region (NCR) and surrounding areas, coordinating efforts to tackle air pollution.
- Sameer App: Developed by CPCB, this app provides real-time, up-to-date AQI data and bulletins for the public.

Monitoring Mechanisms:

- CAQM works with CPCB to monitor and enforce pollution control measures in the Delhi-NCR region, including the use of flying squads.
- Online Continuous Emission Monitoring Systems (OCEMS) are mandated for highly polluting industries, with data transmitted to CPCB.

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- Satellite data and ground-level monitoring are used to provide comprehensive air quality analysis.

Navi Mumbai Air Quality Index (AQI) Trends (Estimated Average Ranges*) for last 10 years*

Time Period	Typical AQI Range	Status	Key Contributing Factors
2024 - 2026	120 - 250+	Moderate to Poor	Intense construction, dust, winter temperature inversion
2021 - 2023	100 - 200+	Moderate to Poor	Increased infrastructure development, post-pandemic traffic
2016 - 2020	80 - 180	Satisfactory to Moderate	Industrial emissions (MIDC) and rapid urbanization

Inspite of various Agencies and Systems for AQI Monitoring, the air quality deteriorates, so AQI (Air Quality Index) awareness is crucial for protecting public health, enabling individuals to minimize exposure to pollution-related illnesses, and assisting in informed decision-making regarding outdoor activities. By understanding real-time air quality, people can take precautions against respiratory and cardiac issues, particularly in poor or severe conditions.

It is essential for people to participate in sustainability initiatives like carpooling, using public transportation, switching to electric vehicles (EVs), reducing domestic waste burning, engaging in waste management, energy conservation, and supporting policies that promote cleaner industries. Joining eco-clubs, participating in tree-planting drives ("Ek Ped Maa Ke Naam"), and lobbying for greener urban planning, such as better cycling lanes.

statement of the Problem:

Recently, the State of Global Air 2025 report by the Health Effects Institute (HEI) and Institute for Health Metrics and Evaluation (IHME) warns that air pollution caused nearly 2 million deaths in India in 2023, making it one of the highest globally. **43% rise** in air pollution-linked deaths since 2000 (from 1.4 million to 2 million). Communication about air quality has the potential to reduce the adverse effects of air pollution through generating awareness and catalyzing public opinion in support of policies for air pollution reduction and through education for individual risk mitigation behaviors.

Air Quality Index awareness positively influences people's participation in sustainability initiatives by shaping their attitudes, intentions, and perceived ability to engage in environmentally responsible behaviors.

This study proposes to explore the awareness of the people regarding air quality index and how it influences their participation in sustainability initiatives in the city of Navi Mumbai. Thus, the problem under study is stated as "A study on the relationship between air quality index awareness and people's participation in sustainability initiatives"

Significance of the Study:

Since air quality directly affects human health, this study emphasizes the connection between environmental awareness and health-protective behavior. Increased participation in sustainability initiatives can lead to improved air quality, thereby contributing to better public health outcomes. Thus, enhances understanding of how Air Quality Index (AQI) awareness influences people's participation in sustainability initiatives,

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addressing a gap in environmental behavior research.

The study provides useful insights for policymakers, Environmental NGOs and environmental organizations to design awareness-based programs that encourage public participation in sustainability initiatives such as to protect the environment, preservation of resources and promoting long-term social and economic well—being. By linking air quality awareness with sustainable initiatives, the study supports efforts toward environmental protection, public health improvement, and sustainable development.

Literature Review:

- **Liu et al., (2017)[2],** The paper examines public awareness of air quality and perceptions of its health impacts in Wuhan, China. The survey targeted 1225 participants, of which 65% perceived the air quality in Wuhan as poor and 95% recognised direct link between air pollution and human health. The study highlights the need for better environmental education among the people and implementation of stricter regulations by government.
- **Raj, H., & Vijaykumar, S. (2019)[3],** The research highlights the severity of growing air pollution in Urban states of India, which lacks to achieve the required standards of air quality for good health. The aims of this paper is to study the different methods for calculation of air pollutants which will enable the authorities to take necessary actions against the rise in air pollutants
- **Krishna et al. (2021)[4],** The main objective of this study is to create awareness among parents regarding the effect of air pollution on children. The paper adopted cross-sectional survey study. The data was collected from 100-120 parents using structured online questionnaire and analyzed through SPSS with chi-square tests. The results showed that a most of the parents are aware of the effects of air pollution, with females showing slightly higher awareness than males. The findings highlight the importance of sustained public awareness in reducing the health risks associated with air pollution and protecting children's well-being.
- **Al-Shidi et al. (2021)[5],** The paper investigates the perception, attitude and behavior of the public about air pollution in Muscat, the capital of Oman. The data was collected from 1,289 respondents using online questionnaire. Descriptive statistics such as frequencies and percentages were used initially. The responses were analyzed using, the Statistical Package for the Social Sciences (SPSS). The findings revealed high awareness of air pollution and its health risks, with social media serving as the primary source of information; females demonstrated greater sensitivity to air pollution impacts, while males and older participants showed higher interest in air quality information.
- **Lal et al. (2023)[6],** The study explores the Indian AQI scenario and its impact on human health. To know the AQI scenario, a small study was carried out in Rajasthan. The findings emphasize $PM_{2.5}$ as the most harmful pollutant, as fine particles penetrate deep into the lungs, causing asthma and reduced lung function. The manuscript also reviews various plans of Indian government aimed at improving air quality and environmental sustainability.

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- **Guttikunda, S., & Dammalapati, S. (2024)[7],** The authors presented data on Air Quality Index and Analysis for Indian cities from the official daily air quality index (AQI) bulletins issued by the Central Pollution Control Board (CPCB), New Delhi, India, between 2015-2023. The paper mentioned, India's AQI methodology was approved in 2014 and the online AQI bulletin started disseminating the data from 2015. It also explains the equation to calculate AQI applied by all countries. They also suggest to increase the number of stations per city to at least 4, by 2025.
- **Aggarwal et al. (2025)[8],** The objectives of this study is to investigate university students' intentions to address air quality concerns using the theory of planned behavior (TPB). Data were collected through a structured questionnaire measuring attitudes, subjective norms, perceived behavioural control, and behavioural intentions. The relationships were analysed using statistical techniques to assess both the strength and the significance of each predictor. The findings reveal that perceived behavioral control and positive attitudes are the strongest predictors of pro-environmental behavior, while subjective norms also exert a significant influence.
- **Nachankar et al. (2025)[9],** The This study examined indoor air quality (IAQ) across diverse urban settings in Pune, Maharashtra, highlighting indoor air pollution as a growing public health concern driven by poor ventilation, sealed buildings, traffic emissions, and synthetic materials. Using the TEMTOP LKC-1000S monitor and a structured questionnaire, IAQ parameters such as $PM_{2.5}$, PM_{10}, VOCs, formaldehyde, temperature, humidity, and AQI were measured in residential, commercial, educational, healthcare, hotel, and transport environments. Results revealed significant spatial variation, with hotels and public transport exhibiting the poorest air quality due to high particulate matter and VOC concentrations, while commercial spaces showed comparatively better IAQ owing to improved ventilation and design.
- **Pinakidou, S. (2025)[10],** This paper focuses on the review of public perception of air quality and awareness studies of the past 25 years (1999–2024). It shows that although public concern about air pollution has increased globally, most people remain unaware of official air quality indexes and rely more on personal sensory perceptions shaped by their environment, psychology, and media exposure. It highlights how emerging technologies, big data, and mobile applications are transforming air quality awareness research, while emphasizing that air pollution remains a severe health burden in developing countries.

Research Gap:

Though numerous air quality index awareness and in people's sustainability initiatives have been conducted worldwide, there hasn't been much academic research on the same area in India, specifically in Navi Mumbai area.

Objectives of the Study:

1. To assess the level of Air Quality Index awareness among people.
2. To examine the relationship between Air Quality Index awareness and people's participation in sustainability initiatives.

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Hypothesis of the Study:

HYPOTHESIS 0: There is no significant relationship between Air Quality Index awareness and people's participation in sustainability initiatives.

HYPOTHESIS 1: There is significant relationship between Air Quality Index awareness and people's participation in sustainability initiatives.

Research Methodology:

Research Design: The study adopted a cross-sectional survey approach within a descriptive–analytical research framework. Data were collected at a single point in time using a structured questionnaire to assess Air Quality Index (AQI) awareness among people and to examine the relationship between Air Quality Index (AQI) awareness and people's participation in sustainability initiative.

Population of the study :

The population consists of the general public, residing in Navi Mumbai area. The area was selected due to rising concerns regarding air pollution and importance of sustainability in this area. The respondents include individuals from different demographic backgrounds like gender, age, education level, and occupation to ascertain diverse representation.

Sample size and Sampling Technique *:*

A sample size of 85 respondent was selected for the study using a convenience sampling technique, considering accessibility and willingness of respondents to participate. This sample size was considered adequate for descriptive statistics, Reliability Analysis and correlational analysis in social science research.

Sources of data collection :

Primary Data: Primary data collected from people of Navi Mumbai through online structured questionnaires (5-point Likert scale) which will be automatically stored in a spreadsheet.

- Section A: Demographic details of respondents
- Section B: AQI awareness (knowledge of AQI, sources of information)
- Section C: Participation in sustainability initiatives (waste management, energy conservation, eco-friendly practices, community participation)

Secondary Data: Secondary data was collected through various sources such as research papers, books, journals, internet websites and various reports to support the theoretical framework and literature review.

Data Analysis:

The demographic profile of the respondents was analysed using percentage analysis to understand the background characteristics of the sample. The respondents were classified based on gender, age, education level, and occupation. This analysis helped in understanding the composition of the sample and provided context for interpreting the results of AQI awareness and participation in sustainability initiatives.

Descriptive statistics - Descriptive statistics were used to assess the level of Air Quality Index (AQI) awareness and people's participation in sustainability initiatives. The mean AQI awareness score was 4.06, indicating a high level of awareness among respondents. The negative skewness suggests that the majority of respondents reported

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higher awareness levels, with responses concentrated toward the upper end of the scale.

Similarly, the mean sustainability participation score was 4.10, reflecting a high level of engagement in sustainability initiatives. The relatively low standard deviation indicates consistency in sustainable behaviors among respondents.

Reliability Analysis:

Reliability analysis was conducted using Cronbach's Alpha to examine the internal consistency of the measurement scales. The AQI Awareness scale recorded a Cronbach's Alpha value of 0.888, indicating very good reliability. The Sustainability Participation scale recorded a Cronbach's Alpha value of 0.936, indicating excellent reliability. These values exceed the recommended threshold of 0.70, confirming that the items used in the study are reliable and suitable for further analysis

Correlation Analysis:

Variables	Correlation (r)
AQI Awareness & Sustainability Participation	0.657

Pearson correlation analysis revealed a strong positive relationship between AQI awareness and sustainability participation (r = 0.657), indicating that higher awareness is associated with higher participation in sustainable practices.

Regression Analysis:

Statistic	Value
R Square	0.432
Adjusted R Square	0.425
Standard Error	0.433
Observations	85

Simple linear regression analysis showed that AQI awareness significantly predicts sustainability participation ($R^2 = 0.432$, $p < 0.001$). AQI awareness explained 43.18% of the variance in sustainability participation.

ANOVA Results:

Statistic	Value
F-value	63.07
Significance (p-value)	8.49×10^{-12}

The regression model is statistically significant.

Regression Coefficients:

Predictor	Coefficient (β)	p-value
AQI Awareness Score	0.587	< 0.001

Interpretation:

AQI awareness has a statistically significant positive effect on sustainability participation. A one-unit increase in AQI awareness results in a 0.587-unit increase in sustainability participation.

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Hypothesis Testing Null Hypothesis (H_0)

There is no significant relationship between Air Quality Index awareness and people's participation in sustainability initiatives.

Alternative Hypothesis (H_1)

There is a significant relationship between Air Quality Index awareness and people's participation in sustainability initiatives.

Decision Rule*:*

Since the p-value was less than 0.05, the null hypothesis was rejected. The study confirms a statistically significant relationship between AQI awareness and sustainability participation.

Limitations of the Study:

Data for the research will be collected from Navi Mumbai region only.

Findings and Suggestions:

The participants of this survey consist of 80% female and 20% male. 44.7% belong to the age group 18-25, 24.7% to the age group of 36-45 and 15.3% to the age group of 26-35 as well as 46-
50. The education level of the participants having professional degree was 27.1% followed by post-graduate degree 25.9%. The occupation of employed(private) participants' is 45.9%. Sources of awareness about air quality index among majority of respondents is social media (88.2%) followed by mobile/internet (80%).

The findings indicate that increased AQI awareness leads to greater engagement in sustainability initiatives. Awareness plays a crucial role in shaping environmentally responsible behavior.

Conclusion:

Since the findings indicate that individuals who possess higher levels of awareness regarding air quality and AQI-related information are more likely to engage in sustainable practices such as waste management, energy conservation, green consumption, sustainable transportation, and community participation. This highlights the importance of awareness as a key factor associated with pro-environmental behaviour. The study underscores the role of effective AQI awareness programmes in encouraging public participation in sustainability initiatives and suggests that enhancing environmental awareness can contribute to improved environmental outcomes. However, sustained participation may further require supportive infrastructure and policy interventions.

The study concludes that AQI awareness significantly influences sustainability participation. Enhancing public awareness can therefore contribute to improved environmental outcomes.

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