



AIR POLLUTION AS A PUBLIC HEALTH CRISIS IN INDIAN CITIES: A POST-COVID LEGAL ANALYSIS

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INTRODUCTION

Air pollution has emerged as one of the most pressing environmental and public health challenges of the twenty-first century, particularly in rapidly urbanising countries such as India. Over the past few decades, the pace of industrialisation, urban expansion and motorisation has significantly altered the environmental landscape of Indian cities, leading to a steady decline in air quality. Metropolitan regions such as Delhi, Mumbai, Kolkata, Chennai and Lucknow frequently record air pollution levels that exceed both national ambient air quality standards and international guidelines prescribed by the World Health Organisation (WHO). The persistent presence of harmful pollutants, including particulate matter (PM_{2.5} and PM₁₀), nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO) and ozone, has transformed air pollution from a mere environmental concern into a serious public health crisis affecting millions of urban residents. The health implications of air pollution are both immediate and long-term. Exposure to polluted air has been linked to a wide range of respiratory ailments, including asthma, bronchitis and chronic obstructive pulmonary disease (COPD). In addition, medical research has established strong associations between air pollution and cardiovascular diseases, stroke, lung cancer and weakened immune systems. More recent studies have also suggested possible connections between air pollution and neurological disorders, metabolic diseases and adverse reproductive outcomes. Vulnerable populations, particularly children, the elderly and individuals with pre-existing health conditions, are disproportionately affected. The cumulative impact of these health risks imposes a substantial burden on public health systems and undermines overall quality of life, making air pollution a matter of urgent policy and legal concern.

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In the Indian context, the complexity of air pollution is heightened by the diversity of its sources. Urban air pollution arises from a combination of vehicular emissions, industrial activities, thermal power plants, construction and demolition activities, road dust, and the open burning of waste and biomass. Seasonal factors, such as agricultural residue burning in northern states, further exacerbate the problem, particularly during winter months when meteorological conditions, such as temperature inversion, trap pollutants close to the ground. These multiple and overlapping sources make it difficult to address air pollution through isolated interventions, thereby necessitating a comprehensive and coordinated regulatory approach.

Despite the seriousness of the issue, regulatory efforts in India have often struggled to produce sustained improvements in air quality. One of the key challenges lies in the gap between legal provisions and their effective implementation. While India has developed a relatively robust legal framework for environmental protection, enforcement remains inconsistent due to institutional fragmentation, lack of coordination among regulatory bodies, and limited monitoring capacity. Pollution Control Boards, which are tasked with implementing environmental laws, frequently face constraints in terms of resources, technical expertise and administrative authority. As a result, compliance with air quality standards remains uneven, and violations often go unpunished.

The constitutional framework of India provides a strong normative basis for addressing environmental concerns, including air pollution. Although the Constitution of India does not explicitly recognise a right to a clean environment, judicial interpretation has expanded the scope of Article 21, the right to life and personal liberty, to include the right to a healthy and pollution-free environment. This interpretation reflects a progressive understanding of fundamental rights, recognising that environmental quality is intrinsically linked to human dignity and well-being. In addition, Article 48A of the Directive Principles of State Policy mandates the State to protect and improve the environment, while Article 51A(g) imposes a fundamental duty on citizens to safeguard natural resources. Together, these provisions establish a constitutional mandate for environmental protection, placing responsibility on both the State and individuals. In furtherance of this constitutional mandate, India has enacted several statutory measures to control and prevent air pollution. The Air (Prevention and Control of Pollution) Act, 1981, represents a significant legislative effort to regulate air quality by establishing Central and State Pollution Control Boards with the authority to set standards and monitor compliance. The Environment (Protection) Act, 1986, enacted in the aftermath of the

Bhopal Gas Tragedy, provides a comprehensive framework for environmental regulation by empowering the central government to take necessary measures to protect and improve environmental quality. Additionally, policy initiatives such as the National Clean Air Programme (NCAP) have been introduced to address air pollution at the national level. However, the effectiveness of these measures has been limited by challenges in implementation, enforcement and coordination.

The judiciary has played a crucial role in shaping environmental governance in India. Through the mechanism of Public Interest Litigation (PIL), the Supreme Court and various High Courts have actively intervened in matters concerning environmental protection. Landmark judgments have expanded the scope of environmental rights and directed the government to adopt specific measures aimed at reducing pollution. For instance, judicial interventions have led to the introduction of cleaner fuels, the regulation of industrial emissions and the relocation of polluting industries. The establishment of the National Green Tribunal (NGT) has further strengthened environmental adjudication by providing a specialised forum for the resolution of environmental disputes and enforcement of environmental laws.¹ Nevertheless, while judicial activism has contributed significantly to environmental protection, it cannot substitute for effective governance and sustained administrative action.

The outbreak of the COVID-19 pandemic in 2020 provided an unprecedented opportunity to observe the relationship between human activity and environmental quality. The nationwide lockdown imposed to contain the spread of the virus resulted in a drastic reduction in industrial operations, vehicular traffic and other pollution-generating activities. Consequently, several Indian cities experienced a marked improvement in air quality within a short period. Studies reported significant reductions in concentrations of key pollutants, including PM2.5, nitrogen oxides and carbon monoxide, during the lockdown phase. This temporary improvement demonstrated that meaningful reductions in air pollution are achievable when emissions are effectively controlled.

However, the post-COVID period revealed the limitations of these gains. As economic activities resumed and restrictions were lifted, pollution levels began to rise rapidly, often returning to or even exceeding pre-pandemic levels. This trend highlights the structural weaknesses in India's environmental governance framework. The temporary nature of the

¹ *M.C. Mehta v. Union of India* (1987) 1 SCC 395

improvement suggests that existing regulatory mechanisms are not designed to ensure long-term sustainability. Instead, they tend to produce short-term results without addressing the underlying causes of pollution.

The post-COVID era has therefore brought renewed attention to the need for a more comprehensive and integrated approach to air pollution control. Key challenges include weak enforcement mechanisms, lack of accountability, policy inconsistencies and limited public participation. There is also a need to strengthen data collection and monitoring systems to enable evidence-based decision-making. In addition, the role of technology, including real-time air quality monitoring and cleaner production methods, must be emphasised in developing effective solutions. In this context, the present study seeks to examine air pollution not merely as an environmental issue but as a critical public health and legal challenge in the post-COVID era. It aims to analyse the extent to which the Indian legal framework has been effective in addressing air pollution as a public health crisis and to identify the gaps that continue to impede effective control. The study adopts a doctrinal research methodology, focusing on constitutional provisions, statutory laws, judicial decisions and policy measures, while also incorporating a limited comparative perspective based on international practices.

Air pollution in Indian cities represents a complex and multifaceted challenge that requires urgent and sustained attention. While India has developed a comprehensive legal framework for environmental protection, its effectiveness is undermined by shortcomings in implementation and enforcement. The post-COVID resurgence of pollution levels underscores the need for systemic reforms that go beyond temporary measures. Addressing air pollution as a public health crisis requires a holistic approach that integrates legal, policy and technological solutions, supported by strong institutional capacity and active public participation. Only through such coordinated efforts can the fundamental right to clean air be realised and the health and well-being of present and future generations be protected.

AIR POLLUTION IN URBAN INDIA: A PUBLIC HEALTH PERSPECTIVE

Defining Air Pollution: Statutory and Scientific Perspectives: The concept of air pollution, though widely understood in everyday discourse, requires careful examination from both statutory and scientific perspectives to appreciate its legal and public health implications. In the Indian legal framework, air pollution is defined under Section 2(b) of the *Air (Prevention and Control of Pollution) Act, 1981*, as the presence of any “air pollutant” in the atmosphere.

Section 2(a)² further elaborates that an “air pollutant” includes any solid, liquid or gaseous substance, including noise, present in such concentration as may be, or tend to be, injurious to human beings, other living creatures, plants, property or the environment. This statutory definition is intentionally broad and flexible, enabling regulatory authorities to address a wide range of pollutants without being constrained by rigid classifications. From a legal standpoint, the inclusiveness of this definition is significant. It allows for the incorporation of emerging scientific knowledge regarding pollutants and their effects. For instance, while earlier regulatory frameworks focused primarily on visible pollutants such as smoke and dust, contemporary environmental law recognises the harmful effects of microscopic particles such as PM_{2.5}, which are not visible to the naked eye but have severe health consequences. Similarly, the inclusion of noise within the definition reflects an expanded understanding of environmental pollution that goes beyond traditional air contaminants. However, while the statutory definition provides a broad framework, its effectiveness as a regulatory tool depends on the establishment of specific standards and thresholds. In India, these standards are prescribed under the National Ambient Air Quality Standards (NAAQS), which set permissible limits for various pollutants. Despite periodic revisions, concerns have been raised regarding the adequacy of these standards in protecting public health. This is particularly evident when compared with international benchmarks.

Scientific perspectives on air pollution provide a more detailed understanding of the nature and impact of pollutants. The World Health Organisation (WHO) has classified outdoor air pollution as a Group 1 human carcinogen, indicating the highest level of risk based on available evidence. This classification is supported by extensive epidemiological studies linking long-term exposure to pollutants, especially fine particulate matter (PM_{2.5}), with lung cancer, cardiovascular diseases, chronic respiratory conditions and adverse reproductive outcomes.³ The WHO’s Global Air Quality Guidelines (2021) recommend an annual mean PM_{2.5} concentration of 5 µg/m³, reflecting a precautionary approach aimed at minimising health risks. In contrast, India’s current NAAQS prescribe a significantly higher limit of 40 µg/m³. This disparity highlights a critical issue in environmental regulation: the gap between legal standards and scientific evidence. While economic and developmental considerations may influence the

² Air (Prevention and Control of Pollution) Act 1981 (Air Act), s 2(a) (definition of 'air pollutant' as any solid, liquid or gaseous substance, including noise, present in the atmosphere in such concentration as may be injurious); s 2(b) (definition of 'air pollution').

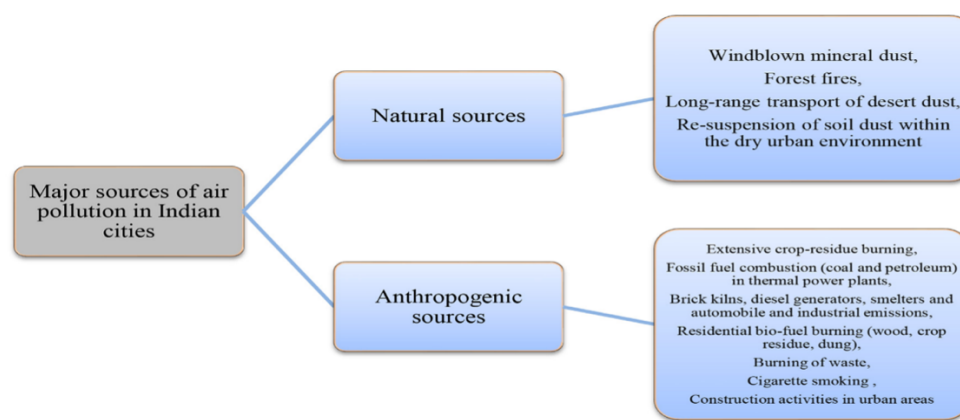
³ World Health Organization, WHO Global Air Quality Guidelines: Particulate Matter (PM_{2.5} and PM₁₀), Ozone, Nitrogen Dioxide, Sulphur Dioxide and Carbon Monoxide (WHO, Geneva, 2021) 11. The WHO classifies outdoor air pollution as a Group 1 carcinogen.

setting of standards, the divergence raises important questions regarding the extent to which existing legal frameworks adequately safeguard public health. The scientific understanding of air pollution also emphasises the cumulative and synergistic effects of multiple pollutants. In urban environments, individuals are rarely exposed to a single pollutant in isolation; rather, they encounter a complex mixture of substances that interact in ways that may amplify their harmful effects. This complexity poses challenges for regulatory frameworks, which often address pollutants individually rather than collectively.

Another important aspect of the conceptualisation of air pollution is its temporal and spatial variability. Pollution levels can fluctuate significantly depending on factors such as time of day, season and geographic location. For example, urban areas may experience higher pollution levels during peak traffic hours, while seasonal phenomena such as temperature inversion can lead to the accumulation of pollutants over extended periods. These variations complicate the task of monitoring and enforcement, requiring dynamic and adaptive regulatory approaches. In addition to its physical and chemical characteristics, air pollution must also be understood in terms of its social and economic dimensions. The distribution of pollution exposure is often uneven, with marginalised communities facing higher levels of risk due to their proximity to pollution sources and limited access to resources. This raises important questions of environmental justice and equity, which are increasingly recognised as integral to the conceptual framework of environmental law. Thus, the statutory and scientific perspectives on air pollution, when considered together, provide a comprehensive understanding of the issue. While the legal framework establishes the parameters for regulation, scientific evidence informs the assessment of risks and the formulation of standards. Bridging the gap between these perspectives is essential for developing effective policies that protect public health and ensure environmental sustainability. These perspectives are essential for developing effective policies that protect public health and ensure environmental sustainability.

Sources of Urban Air Pollution in India: Major outdoor and indoor air pollutants in urban areas can be primary or secondary air pollutants. Primary air pollutants that are emitted directly include particulate matter (PM_{2.5}, PM₁₀, suspended particulate matter (SPM), respirable particulate matter (RPM)), SO_x, NO_x, CO, ammonia, and dust particles, while the secondary air pollutants involve ozone, smog, Peroxyacyl nitrates (PANs), etc. The developing nations like India, with ongoing urbanisation, are suffering from increased air pollution issues due to the lack of services such as adequate transportation management, suitable roads, and unplanned

distribution of industries. The congested roads in cities reduce average vehicular speed, resulting in higher vehicular emissions, adding to air pollution levels (West Bengal Pollution Control Board, 2010). The increasing and unplanned urbanisation, coupled with industrialisation and population growth, is posing a threat to human health by increasing air pollution levels, leading to several health issues. Additionally, the complex and intensive human activities in these urban areas are fueling the problem by increasing the emission of pollutants. In Indian cities, the air pollutants are either emitted from natural sources such as long-range transport of desert dust influx originating from the western arid regions of Africa, the Middle-East, and Thar (Rajasthan) regions, predominantly during summer and pre-monsoon season, or they can be of anthropogenic origin, as given in Figure 2.⁴



Industrial Emissions: The 51% Contributor: India's industrial sector, coal-fired power plants, brick kilns, steel mills, cement factories, and chemical processing units, is the single largest contributor to national particulate pollution. India operates over 200 coal-fired thermal power stations, many running on high-ash domestic coal, that emit sulphur dioxide (SO₂), nitrogen oxides (NO_x), and primary PM_{2.5} at rates far exceeding plants in China, the EU, or the US. Despite a 2015 notification mandating Flue Gas Desulphurisation (FGD) installation at all plants by 2017, a deadline subsequently extended to 2022 and then 2027, compliance remains abysmally low. As of 2025, fewer than 10% of coal power plants have installed FGD systems. The brick kiln sector, comprising over 140,000 units, mostly in the IGP, is another massive but poorly regulated emitter, burning coal and biomass in designs that have remained unchanged for decades.

⁴ Kaur, R. & Pandey, P., *Air Pollution, Climate Change, and Human Health in Indian Cities: A Brief Review*, (2021) 3 *Frontiers in Sustainable Cities*, Article 705131, available at: [Full Article](#) (last visited Apr. 30, 2026)

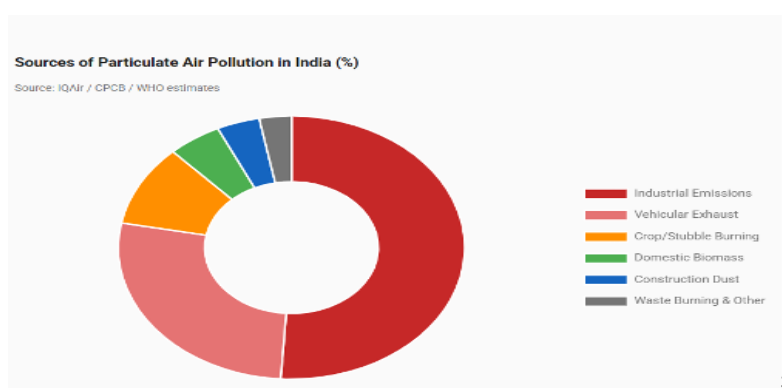
Vehicular Emissions: 27% and Growing: India's vehicle fleet has grown exponentially from approximately 60 million in 2000 to over 350 million registered vehicles by 2025. Traffic congestion in major cities reduces average speeds to 15–20 km/h, at which vehicles emit pollutants at four to eight times the rate of free-flowing traffic. While the leapfrog from BS-IV to BS-VI emission standards in 2020 was a landmark policy achievement, the benefits are offset by the sheer growth in vehicle numbers, fuel adulteration (particularly in two- and three-wheelers), and the continuing dominance of diesel vehicles in commercial transport. The TRUE Initiative study in Delhi and Gurugram found that real-world vehicle emissions significantly exceed laboratory test results, a gap that undermines the health benefits expected from regulatory standards.

Agricultural Burning: The Seasonal Catastrophe: Every October and November, farmers in Punjab, Haryana, and western Uttar Pradesh set fire to an estimated 15–20 million tonnes of paddy stubble, the residue left after mechanised rice harvesting, creating a thick blanket of smoke that engulfs the entire IGP. Satellite imagery from NASA's FIRMS system records tens of thousands of fire points across these states during the burning season. The smoke combines with vehicle emissions, industrial pollutants, and Diwali fireworks to produce the annual "Great Smog" that pushes Delhi's AQI into "severe" and "hazardous" categories for weeks. In November 2016, this phenomenon produced the worst air quality event in Delhi's recorded history, with PM_{2.5} concentrations exceeding 999 µg/m³, nearly 200 times the WHO safe limit. Despite government subsidies for Happy Seeder machines and in-situ crop residue management, the 2024 and 2025 burning seasons showed only marginal declines in fire counts, constrained by the short turnaround window between paddy harvest and wheat sowing and the cost of alternatives for smallholder farmers.

Household Air Pollution: The Silent Indoor Killer: Over 100 million Indian households, predominantly in rural areas and urban slums, rely on solid fuels (wood, dung cakes, crop residues, coal) for cooking and heating, producing indoor PM_{2.5} concentrations that routinely exceed 500 µg/m³. The Lancet Countdown 2025 reports that household air pollution was associated with 113 deaths per 100,000 people in India in 2022, with rural mortality rates (125 per 100,000) significantly exceeding urban rates (99 per 100,000). Women and children bear the heaviest burden: the primary cook in an Indian household using a traditional chulha (clay stove) inhales the equivalent of 400 cigarettes of smoke per day. The Pradhan Mantri Ujjwala Yojana (PMUY), which has distributed over 100 million free LPG connections since 2016, has

been transformative, but refill rates remain low in many states, with 30–40% of beneficiaries reverting to solid fuels due to the recurring cost of LPG cylinders, supply disruptions, and entrenched cooking traditions.

Construction Dust, Waste Burning, and Other Sources: India's construction boom generates enormous quantities of dust from demolition, earthmoving, and cement mixing, particularly in cities undergoing rapid infrastructure expansion like Delhi-NCR, Bengaluru, Hyderabad, and Mumbai. Open waste burning, both in landfills and at the neighbourhood level, releases black carbon, dioxins, furans, and heavy metals. The Ministry of Environment identifies waste burning as a major contributor to India's particulate pollution. Earth5R's waste audits have demonstrated that burning occurs primarily when waste collection is irregular or when households lack segregation knowledge—and that community-level waste segregation can reduce burning incidents and improve air quality almost immediately.



Public Health Burden: The Legal Relevance of Epidemiological Evidence: The public health burden of air pollution in India is substantial and well-documented through epidemiological research. This body of evidence plays a crucial role in shaping legal and policy responses, as it provides empirical support for regulatory measures aimed at protecting human health. Fine particulate matter (PM_{2.5}) is considered one of the most harmful pollutants due to its ability to penetrate deep into the respiratory system and enter the bloodstream. Once inside the body, these particles trigger inflammatory responses that can damage various organs, including the lungs, heart and brain. Long-term exposure to PM_{2.5} has been causally linked to chronic respiratory diseases, cardiovascular disorders, stroke and lung cancer. Short-term

⁵ Earth5R, “India Air Pollution 2025 Crisis: Community Action,” Earth5R (last visited Apr. 30, 2026), available at [India Air Pollution 2025 Crisis: Community Action](#).

exposure to high levels of air pollution can also have serious health consequences. Studies have shown a correlation between elevated pollution levels and increased hospital admissions for respiratory and cardiovascular conditions. Acute exposure can exacerbate existing health conditions, leading to severe complications and, in some cases, death.

The burden of air pollution is not uniformly distributed across the population. Vulnerable groups, including children, the elderly and individuals with pre-existing health conditions, are particularly at risk. Children are more susceptible due to their developing respiratory systems, while elderly individuals may have reduced physiological resilience. Socio-economic factors further influence exposure, with disadvantaged communities often facing higher levels of pollution and limited access to healthcare.

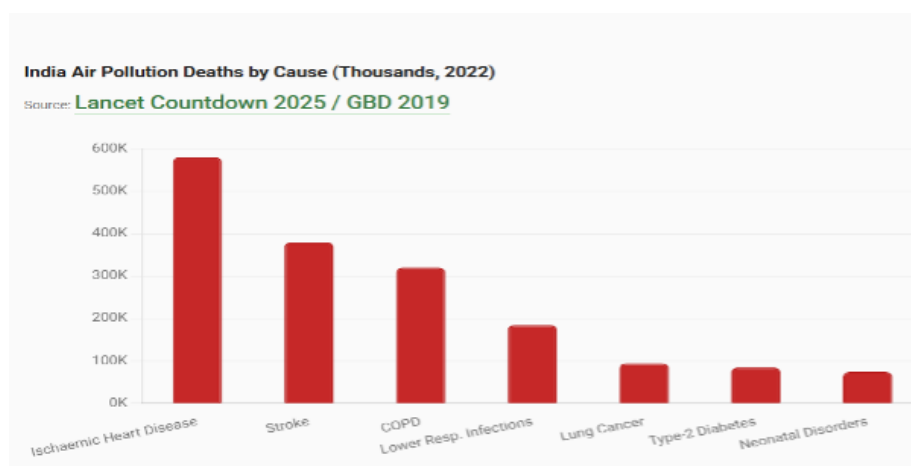
The health consequences of India's air pollution in 2025 are staggering in their scale and severity. The Lancet Countdown 2025 attributes 1.72 million deaths to anthropogenic PM_{2.5} in India in 2022, a 38% increase from 2010. The State of Global Air 2024 puts the total from combined indoor and outdoor air pollution at over 2 million annually. India accounts for an estimated 70% of all global deaths linked to air pollution, a proportion far exceeding its 18% share of the world population.

PM_{2.5} fine particulate matter, less than 2.5 micrometres in diameter, roughly thirty times thinner than a human hair, is the most lethal pollutant because it penetrates deep into the lungs and enters the bloodstream. Chronic exposure is causally linked to ischaemic heart disease, stroke, chronic obstructive pulmonary disease (COPD), lung cancer, type-2 diabetes, adverse pregnancy outcomes (low birth weight, preterm birth), and cognitive decline. In cities like Bengaluru, approximately 50% of children suffer from asthma. Delhi's children have been found to have 43% lower lung capacity compared to children in cleaner regions. A 2024 Lancet study examining ten Indian cities established a causal link between short-term PM_{2.5} spikes and daily mortality, the first multi-city Indian study to apply causal inference methods across such a broad range of exposures.

Delhi's Children: A Generation at Risk: Studies show that children in Delhi have 43% lower lung capacity compared to those in cleaner regions. Approximately 2.2 million children in Delhi, one in three, suffer from irreversible lung damage caused by chronic air pollution exposure during critical developmental years. Paediatricians report a surge in asthma,

bronchitis, and allergic rhinitis cases every winter, with hospital admissions for respiratory illness tripling during November–January smog events.⁶

The Global Burden of Disease Study 2019 found that 1.67 million deaths, 17.8% of all deaths in India, were attributable to air pollution. Of these, ambient particulate matter pollution caused 980,000 deaths, household air pollution accounted for 610,000, and ambient ozone pollution contributed the remainder. The death rate from ambient PM_{2.5} has been increasing steadily, reflecting rising emissions from energy consumption, urbanisation, industrialisation, and growing vehicle numbers. Ground-level ozone, formed when sunlight reacts with NO_x and volatile organic compounds, is an emerging concern that existing monitoring and policy frameworks have largely overlooked.



The legal relevance of this epidemiological evidence is significant. First, it provides a factual basis for the recognition of the right to a clean and healthy environment as part of the right to life under Article 21 of the Constitution. In cases such as *Subhash Kumar v State of Bihar*, the Supreme Court has emphasised that the right to life includes the right to enjoy pollution-free air and water.⁷ This interpretation is grounded in the understanding that environmental degradation directly affects human health and well-being.

Second, epidemiological evidence supports the case for stricter regulatory standards. The disparity between India's NAAQS and WHO guidelines suggests that existing standards may not be sufficient to protect public health. By demonstrating the health impacts of pollution at

⁶ Earth5R, "India Air Pollution 2025 Crisis: Community Action," Earth5R (last visited Apr. 30, 2026), available at [India Air Pollution 2025 Crisis: Community Action](#).

⁷ *Subhash Kumar v. State of Bihar*, (1991) 1 SCC 598

lower concentrations, scientific research provides a basis for revising these standards to align more closely with international benchmarks.

Third, such evidence strengthens the argument for adopting a precautionary approach to environmental regulation. Given the uncertainties associated with long-term health impacts, it is essential to err on the side of caution and implement measures that minimise exposure to pollutants. This approach has been recognised in Indian environmental jurisprudence, particularly in cases such as *Vellore Citizens' Welfare Forum v Union of India*, where the Supreme Court endorsed the precautionary principle as part of the law of the land.⁸

Finally, the integration of public health considerations into environmental law highlights the need for a more holistic approach to governance. Air pollution cannot be effectively addressed through isolated legal measures; it requires coordination between environmental regulation, public health policy and urban planning. By recognising the interconnected nature of these issues, policymakers can develop more comprehensive and effective strategies.

LEGAL FRAMEWORK FOR AIR POLLUTION CONTROL IN INDIA

Constitutional Provisions –

Article 21: The Right to a Pollution-Free Environment: Article 21 of the Constitution of India, 1950 guarantees that 'no person shall be deprived of his life or personal liberty except according to procedure established by law.' In a foundational series of decisions, the Supreme Court of India has interpreted the right to life expansively to incorporate the right to live in a clean and pollution-free environment. In *Subhash Kumar v State of Bihar*, the Court held that the right to life guaranteed by Article 21 includes 'the right to enjoyment of pollution-free water and air for full enjoyment of life.'⁹ This interpretive expansion was reinforced in *Virender Gaur v State of Haryana*, where the Court held that 'environmental, ecological, air, water pollution, etc., should be regarded as amounting to violation of art 21.'¹⁰ The cumulative effect of this jurisprudence is to impose an affirmative obligation on the State to take effective legislative and executive measures to prevent air pollution that threatens the life and health of citizens.

⁸ *Vellore Citizens' Welfare Forum v. Union of India*, (1996) 5 SCC 647.

⁹ *Subhash Kumar v State of Bihar* (1991) 1 SCC 598, 607 (SC) (Fathima Beevi J): 'Right to life guaranteed by art 21 includes the right to enjoyment of pollution-free water and air for full enjoyment of life.'

¹⁰ *Virender Gaur v State of Haryana* (1995) 2 SCC 577, 580 (SC).

The right is not merely negative (i.e., freedom from State interference) but positive, requiring the State to actively regulate private actors who pollute the environment.¹¹

Directive Principles and Fundamental Duties: Article 47 of the Constitution mandates the State to regard 'the improvement of public health as among its primary duties. Article 48A, inserted by the Constitution (Forty-Second Amendment) Act, 1976, expressly directs the State to 'endeavour to protect and improve the environment. While Directive Principles are not directly enforceable, the Supreme Court has held that they must guide the interpretation of fundamental rights and impose justiciable obligations on the State when read in conjunction with Article 21. Article 51A(g) imposes upon every citizen a Fundamental Duty to 'protect and improve the natural environment. The courts have invoked this provision to ground citizen-led PIL petitions relating to air pollution, treating the Fundamental Duty as a source of constitutional standing for public-spirited litigants.¹²

Statutory Framework –

The Air (Prevention and Control of Pollution) Act 1981: The Air (Prevention and Control of Pollution) Act 1981 is the principal statute governing air quality regulation in India. Enacted pursuant to India's commitments at the 1972 Stockholm Conference on the Human Environment, the Act establishes a two-tier system of pollution control boards, the Central Pollution Control Board (CPCB) at the national level and State Pollution Control Boards (SPCBs) at the state level. The CPCB is empowered under Section 16 to lay down National Ambient Air Quality Standards (NAAQS) and to advise the Central Government on air pollution control. SPCBs are vested under Section 21 with consent authority over industrial operations in declared air pollution control areas. No person may operate an industrial plant in such areas without the Board's consent. Violations of the consent requirement attract criminal liability under Sections 37 to 40 of the Act, with prescribed penalties of imprisonment for up to six years and a fine.

The Air Act's critical structural weakness lies in Section 43, which requires Board sanction before any court can take cognizance of an offence under the Act. This gatekeeping function, combined with the chronic understaffing of SPCBs and their susceptibility to regulatory capture by industrial interests, has rendered the criminal enforcement mechanism largely

¹¹ MC Mehta v Union of India (Vehicular Pollution) (1998) 6 SCC 60.

¹² Geetanjoy Sahu, 'Implications of Indian Supreme Court's Innovations for Environmental Jurisprudence' (2008) 4(1) Law, Environment and Development Journal 1, 9

inoperative. The Act also notably lacks a citizen suit provision, a lacuna that stands in sharp contrast to comparable legislation in the United States, thereby limiting the ability of affected citizens to directly enforce statutory environmental rights.

The Environment (Protection) Act 1986: The Environment (Protection) Act, 1986, enacted in the aftermath of the Bhopal Gas Tragedy of December 1984, functions as an umbrella statute conferring sweeping powers on the Central Government for the protection and improvement of the environment. Section 3 empowers the Central Government to take all such measures as it deems necessary or expedient for protecting the quality of the environment and preventing, controlling, and abating environmental pollution.

Section 5 of the EPA, which operates notwithstanding anything contained in any other law, empowers the Central Government to issue binding written directions to any person, officer, or authority, including for the closure, prohibition, or regulation of any industry, operation, or process. This power has been operationalised in the context of air pollution control through the Graded Response Action Plan (GRAP) for the National Capital Region, which prescribes a graduated scale of emergency restrictions on pollution-generating activities triggered by deteriorating real-time Air Quality Index (AQI) readings.¹³ The Environment (Protection) Rules 1986 framed under the EPA, prescribe emission standards for specific industries and the NAAQS for ambient air quality.

The National Green Tribunal Act 2010: The National Green Tribunal Act 2010 established the National Green Tribunal (NGT) as a specialised judicial body for the effective and expeditious disposal of civil cases involving substantial questions relating to the environment. The Tribunal is empowered to grant relief and compensation to victims of environmental damage, to order restitution of damaged property, and to direct restitution of the environment. Its composition, combining judicial members drawn from the higher judiciary with expert members possessing specialised knowledge in environmental science and enforcement, affords it a degree of technical competence unavailable in generalist courts.

Policy Instruments: GRAP and the National Clean Air Programme: Beyond statutes and tribunals, the legal-policy framework includes key instruments such as the Graded Response

¹³ Ministry of Environment, Forest and Climate Change, *Notification S.O. 3786(E)* (6 December 2017) notifying the Graded Response Action Plan (GRAP) for the National Capital Region. GRAP was originally designed by the Environment Pollution (Prevention and Control) Authority (EPCA) pursuant to Supreme Court directions in *M.C. Mehta v. Union of India* (2016) 8 SCC 197

Action Plan (GRAP) and the National Clean Air Programme (NCAP). GRAP, designed for Delhi-NCR, prescribes emergency-type measures to be implemented when air quality deteriorates beyond certain thresholds. It categorises air-quality levels and attaches specific actions, closure of polluting industries, restrictions on construction, curbs on vehicular movement, and similar measures aimed at reducing emissions during critical periods. Though not a statute itself, GRAP operates under the powers conferred by the Air and Environment Acts and is monitored by a Central-Pollution-Control-Board-led task force, giving it quasi-legal force.

The National Clean Air Programme (NCAP), launched in 2019, aims to reduce particulate matter pollution by 20–30 per cent in 102 cities by 2024 through city-specific action plans, improved monitoring, and better enforcement. The programme assigns responsibility to the State and local authorities to implement measures aligned with the Air Act and the Environment Act, thereby creating a policy-cum-regulatory pathway for improving air quality. NCAP also stresses inter-agency coordination, public participation, and regular reporting, which are essential for integrating air-pollution control into broader urban-governance frameworks.

Structural Gaps and Enforcement Challenges: Despite this elaborate constitutional and statutory architecture, the air-pollution-control framework faces structural and enforcement challenges. The enforcement of the Air Act and the Environment Act is weakened by inadequate monitoring capacity, lack of technical expertise at the local level, and political and economic pressures that discourage strict compliance. The hierarchical structure of regulation, with CPCB at the top and SPCBs at the State level, sometimes leads to delays and coordination problems, particularly when responsibilities are shared between the Union and the States. In the post-COVID period, the rebound of pollution levels after the initial lockdown-phase improvement has highlighted the fragility of enforcement mechanisms and the extent to which regulatory gains are often context-specific rather than institutionalised.

From a conceptual standpoint, the legal framework provides a robust normative and institutional basis for treating air pollution as a public health crisis. The Constitution, statutes, specialised tribunals, and policy instruments collectively form a comprehensive architecture that, if implemented consistently, can significantly improve air quality in Indian cities. The central challenge lies not in the absence of legal tools but in the gap between legal potential

and administrative reality, a gap that subsequent chapters will analyse in the context of judicial responses and post-COVID governance failures.

JUDICIAL RESPONSE AND RIGHT TO CLEAN AIR

The Indian judiciary has played a transformative role in shaping the legal response to air pollution, particularly in urban areas. Beginning in the late 1980s and intensifying in the 1990s and 2000s, courts have increasingly treated environmental degradation, including poor air quality, as a violation of fundamental rights rather than a mere technical or regulatory issue. This shift has been facilitated by the rise of public-interest litigation (PIL), which has allowed citizens, NGOs, and even media organisations to seek judicial intervention on issues of public concern. Through PILs, petitioners have challenged various dimensions of urban air pollution, including vehicular emissions, industrial pollution, construction-related dust, and the burning of waste and crop residue. The Supreme Court, in particular, has issued a series of landmark judgments that have redefined the State's obligations and expanded the scope of environmental regulation.

Public Interest Litigation (PIL) has been the primary vehicle through which the Indian judiciary has engaged with air pollution as a public health and constitutional rights concern. PIL relaxes the traditional locus standi requirement, permitting any public-spirited person to approach the Supreme Court under Article 32 or the High Courts under Article 226 on behalf of those unable to access justice themselves. This procedural innovation has been particularly significant in the environmental domain, enabling civil society organisations, bar association members, and individual lawyers to bring regulatory failures before the constitutional courts.

The Supreme Court's supervisory jurisdiction over environmental matters in Delhi has been exercised continuously since the late 1980s through cases filed by environmental lawyer MC Mehta. These cases have yielded a body of directions covering vehicular emission standards, fuel quality, public transport conversion, and industrial relocation that have substantially shaped Delhi's regulatory landscape. This sustained judicial engagement has been described as a form of 'continuing mandamus', an ongoing writ of mandamus through which the Court retains jurisdiction to monitor compliance and issue fresh directions as circumstances require.¹⁴

¹⁴ Urvashi Narain and Chris Bell, 'Who Changed Delhi's Air? The Roles of the Court and the Executive in Environmental Policymaking' (2006) 37(4) Economic and Political Weekly 3422, 3424.

LANDMARK SUPREME COURT JUDGMENTS**MC Mehta v Union of India (Oleum Gas Leak Case, 1987) –**

Court: Supreme Court of India

Citation: (1987) 1 SCC 395

Date of Judgment: 1986–1987

Bench Strength: Constitution Bench (5 Judges)

Facts of the Case: This landmark case originated from the leakage of oleum gas from a unit of Shriram Food and Fertilisers Industries located in a densely populated area of Delhi. The gas leak resulted in the death of an advocate and caused serious injuries to several workers and residents in the vicinity. The incident occurred shortly after the Bhopal Gas Tragedy, which had already exposed the inadequacies of India's industrial safety and environmental regulatory mechanisms.

Public interest litigation was filed by M.C. Mehta seeking closure or relocation of hazardous industries operating in residential areas and demanding compensation for victims. The case thus presented the Court with an opportunity to address the broader issue of industrial liability in a developing economy.

Issues:

1. Whether industries engaged in hazardous activities should be subject to stricter liability standards.
2. Whether the rule in *Rylands v Fletcher* is adequate in the Indian context.
3. Whether environmental safety falls within the ambit of Article 21 of the Constitution.

Judgment and Core Holding:

The Supreme Court decisively departed from traditional English tort law and established the doctrine of Absolute Liability. It held that:

- Any enterprise engaged in hazardous or inherently dangerous activities owes an absolute and non-delegable duty to the community.

- Such enterprises are liable for all harm resulting from accidents, regardless of fault or negligence.
- No exceptions (such as act of God, third-party fault, or plaintiff's consent) are permitted.

The Court further emphasised that compensation must be correlated to the financial capacity of the enterprise to ensure deterrence.

Legal Principles Established:

- Doctrine of Absolute Liability
- Expansion of Article 21 to include environmental protection and safety
- Corporate social responsibility and accountability.

MC Mehta v Union of India (CNG Case, 1998–2002) –

Court: Supreme Court of India

Citation: (1998) 6 SCC 63; (2002) 4 SCC 356 (SC)

Date of Judgment: 1998–2002

D. Bench Strength: Division Bench

Facts of the Case: This case arose in response to the severe and rapidly deteriorating air quality in Delhi during the 1990s, primarily caused by unchecked vehicular emissions. Rapid urbanisation, exponential growth in motor vehicles, and the widespread use of low-quality fuels resulted in dangerously high concentrations of pollutants such as particulate matter (PM10), nitrogen oxides, and sulphur dioxide. Scientific studies identified Delhi as one of the most polluted cities in the world, with serious consequences for public health, including respiratory disorders, cardiovascular diseases, and increased mortality rates.

In this context, the petitioner, M.C. Mehta, filed a public interest litigation before the Supreme Court under Article 32 of the Constitution, seeking urgent judicial intervention to control vehicular pollution and to protect the fundamental right to life of the citizens.

Issues:

1. Whether the Supreme Court has the authority to direct executive authorities to frame and implement environmental policies.
2. Whether vehicular emissions and resulting air pollution amount to a violation of the fundamental right to life under Article 21 of the Constitution.

Judgment and Core Holding:

The Supreme Court adopted an assertive and interventionist approach, recognising the seriousness of the environmental crisis and its direct impact on public health. Exercising its powers under Article 32, the Court issued a series of binding directions:

- Mandatory conversion of all public transport buses to Compressed Natural Gas (CNG).
- Extension of the CNG requirement to auto-rickshaws and taxis.
- Phasing out and eventual elimination of old and highly polluting vehicles.
- Introduction and enforcement of cleaner fuel standards, including Euro II norms.

The Court also retained jurisdiction and monitored compliance through the mechanism of continuing mandamus, ensuring that its directions were effectively implemented.

Legal Principles Established:

- Recognition of the right to clean air as an integral part of Article 21 (Right to Life).
- Use of continuing mandamus as a tool for sustained judicial supervision.
- Affirmation of the judiciary's role in enforcing environmental governance in cases of executive inaction.

Vellore Citizens' Welfare Forum and the Precautionary Principle –

Court: Supreme Court of India

Citation: (1996) 5 SCC 647 (SC)

Date of Judgment: 1996

Bench Strength: Division Bench

Facts of the Case: This case arose out of a public interest litigation filed by the Vellore Citizens Welfare Forum, highlighting the severe environmental degradation caused by the discharge of untreated industrial effluents by tanneries and other industries in the State of Tamil Nadu. The tanneries, primarily engaged in leather processing, were releasing large quantities of toxic chemicals and untreated waste into nearby rivers, agricultural fields, and underground water sources. This continuous discharge of pollutants led to widespread contamination of drinking water, destruction of fertile agricultural land, and irreversible ecological damage in the region. Local communities suffered significant health hazards, including skin diseases, respiratory problems, and other chronic illnesses, while farmers experienced substantial loss of livelihood due to soil infertility.

The scale of pollution was such that it not only violated statutory environmental norms but also posed a serious threat to public health and environmental sustainability. The petitioners approached the Supreme Court seeking immediate intervention, closure of polluting industries, and compensation for affected individuals.

Issues:

1. Whether industrial pollution and environmental degradation caused by tanneries amount to a violation of the fundamental right to life under Article 21 of the Constitution.
2. Whether international environmental law principles, such as the precautionary principle and polluter pays principle, can be incorporated into and applied within Indian domestic law.

Judgment and Core Holding: The Supreme Court delivered a landmark judgment, recognising that environmental protection is a fundamental aspect of sustainable development and is intrinsically linked to the right to life under Article 21. The Court held that the State has a constitutional obligation to prevent environmental degradation and to ensure a balance between industrial development and ecological protection. In doing so, the Court formally incorporated key principles of international environmental law into Indian jurisprudence.

It introduced and applied the following doctrines:

- **Precautionary Principle:** Environmental measures must anticipate, prevent, and attack the causes of environmental degradation. Lack of scientific certainty should not be used as a reason for postponing preventive action.
- **Polluter Pays Principle:** The polluting industries are absolutely liable to compensate for the harm caused to the environment and to individuals, and they must also bear the cost of restoring the damaged ecology.

The Court further directed the closure of industries that failed to install adequate pollution control mechanisms and ordered compensation for affected persons.

Legal Principles Established:

- The burden of proof lies on the industry or developer to show that its activities are environmentally benign.
- Polluters are legally obligated to pay compensation for environmental harm and bear the cost of remedial measures.
- Formal recognition of sustainable development as a guiding principle of Indian environmental law.
- Integration of international environmental norms into domestic constitutional law.

Vardhaman Kaushik v Union of India (Odd-Even Scheme, 2016) –

Court: National Green Tribunal

Citation: Original Application No. 21 of 2014

Date of Judgment: 2016

Bench Strength: NGT Bench

Facts of the Case: This case arose in the backdrop of an acute air pollution crisis in Delhi, where air quality levels had reached hazardous proportions, particularly during the winter months. The Government of the National Capital Territory (NCT) of Delhi introduced the Odd-Even vehicle rationing scheme in January 2016 as an emergency measure to reduce vehicular emissions.

Under this scheme, private vehicles were allowed to operate on alternate days based on the last digit of their registration numbers: odd-numbered vehicles on odd dates and even-numbered

vehicles on even dates. The objective was to reduce traffic congestion and vehicular pollution, which constituted a major share of Delhi's deteriorating air quality.

The scheme, however, included several exemptions, such as for women drivers, vehicles carrying children, emergency services, and certain categories of public officials. These exemptions raised concerns regarding the actual effectiveness and fairness of the measure. The matter came before the National Green Tribunal to assess both the legality and environmental efficacy of the scheme.

Issues:

1. Whether the Odd-Even vehicle rationing scheme is legally valid under environmental and administrative law.
2. Whether such temporary traffic restrictions are effective in significantly reducing air pollution levels.

Judgment and Core Holding: The National Green Tribunal upheld the validity of the Odd-Even scheme as a legitimate and necessary emergency response to an environmental crisis. It recognised the authority of the government to adopt innovative and immediate measures to combat severe air pollution under the framework of environmental protection laws.

However, the Tribunal expressed serious reservations regarding the implementation of the scheme. It was observed that:

- The large number of exemptions substantially diluted the effectiveness of the policy.
- The scheme, being temporary in nature, could only provide limited and short-term relief.

The Tribunal emphasised that such measures must be supplemented with broader environmental policies.

Aditya Dubey v Union of India (Stubble Burning, 2019) –

Court: National Green Tribunal

Citation: 2019 NGT Orders

Date of Judgment: 2019

Bench Strength: NGT Bench

E. Facts of the Case: This case addressed the persistent and severe problem of stubble burning in the states of Punjab and Haryana, which has been identified as a major contributor to seasonal air pollution in North India, particularly affecting Delhi and the National Capital Region.

Farmers, after harvesting paddy crops, resort to burning crop residue to quickly clear fields for the next sowing season. While this practice is economically efficient and time-saving, it releases massive quantities of smoke, particulate matter, and toxic gases into the atmosphere, significantly deteriorating air quality.

The petitioner approached the National Green Tribunal seeking intervention to control this widespread practice and to mitigate its harmful environmental and public health consequences.

Issues:

1. Whether farmers engaging in stubble burning can be held liable under environmental principles, such as the polluter pays principle.
2. What is the extent of the State's responsibility in preventing and regulating such pollution?

Judgment and Core Holding:

The National Green Tribunal applied the Polluter Pays Principle and imposed environmental compensation on farmers found to be engaging in stubble burning, with fines linked to the extent of land involved.

Additionally, the Tribunal directed the governments of Punjab and Haryana to:

- Ensure strict enforcement of prohibitions on stubble burning
- Promote awareness among farmers regarding environmental consequences
- Facilitate the adoption of alternative crop residue management technologies

Arjun Gopal v. Union of India and the Fight Against Firecracker Pollution –

Court: Supreme Court of India

Citation: (2017) 16 SCC 280 (SC)

Date of Judgment: 2017

Bench Strength: Division Bench

Facts of the Case: This case was initiated through a public interest litigation filed by concerned citizens, including parents of young children, highlighting the severe health hazards caused by the use of firecrackers during festive occasions, particularly Diwali.

Delhi, already burdened with high baseline levels of air pollution, experiences a sharp spike in particulate matter and toxic gases during festival seasons due to the widespread bursting of firecrackers. These emissions exacerbate respiratory illnesses, especially among vulnerable groups such as children, the elderly, and individuals with pre-existing health conditions.

The petitioners sought judicial intervention to regulate or prohibit the use of firecrackers to protect public health and the environment.

Issues:

1. Whether the use of firecrackers, as part of cultural and religious practices, can be restricted in the interest of public health.
2. Whether such pollution violates the fundamental right to life under Article 21.

Judgment and Core Holding: The Supreme Court adopted a balanced approach, seeking to reconcile cultural practices with environmental protection. It imposed several regulatory measures, including:

- Restricting the timing of firecracker use to limited hours.
- Banning the sale and use of particularly harmful and high-emission firecrackers.
- Encouraging the production and use of eco-friendly or “green” firecrackers.
- Directing authorities to strengthen enforcement mechanisms during festive periods.

Constitutional Tort and the Right to Health: The judicial response to air pollution has also been influenced by the development of the concept of constitutional tort. In several cases, the Court has recognised that the State can be held liable for failing to protect the right to life and health, even in the absence of traditional tort law principles. This has been particularly relevant in cases where the State’s inaction or negligence has contributed to environmental harm. For

example, the Court has held that the State has a duty to ensure that environmental laws are effectively enforced and that regulatory authorities are adequately resourced and accountable.¹⁵ In the context of air pollution, the concept of constitutional tort has been applied in cases where the State has failed to take adequate measures to reduce emissions or to protect vulnerable populations from environmental harm. The Court has held that the State cannot plead economic or political expediency as a justification for such inaction, and that the right to life and health is of paramount importance.¹⁶ The Court has also recognised the importance of public participation and transparency in environmental governance, directing authorities to publish air-quality data, respond to citizen complaints, and ensure that monitoring and enforcement are not merely paper exercises.

Public Participation and Transparency: The judiciary has consistently emphasised the importance of public participation and transparency in environmental governance. In several cases, the Court has directed the authorities to publish air-quality data, conduct public hearings, and involve citizens in decision-making processes.¹⁷ The Court has also recognised the role of the media and civil society organisations in raising awareness about environmental issues and holding the State accountable.

The Court has held that the State has a duty to ensure that information about environmental risks is accessible to the public, and that affected communities are given a meaningful opportunity to participate in the decision-making process. In the context of air pollution, these principles have been applied in cases where the State has failed to provide adequate information about air-quality levels or to involve the public in the formulation of air-quality management plans. The Court has directed the authorities to publish real-time air-quality data, to hold public consultations on proposed industrial projects, and to ensure that the concerns of affected communities are taken into account. The Court has also recognised the importance of empowering citizens to seek judicial redress when their right to a clean environment is violated, and has encouraged the use of PILs and other forms of public-interest litigation to address environmental issues.

Enforcement Challenges and the Role of Courts in Bridging the Gap: Despite the robust legal framework and the judiciary's proactive role, the enforcement of environmental laws

¹⁵ *Subhash Kumar v. State of Bihar*, (1991) 1 SCC 598

¹⁶ *MC Mehta v. Union of India*, (1987) 1 SCC 395

¹⁷ *MC Mehta v. Union of India*, (1998) 6 SCC 63.

remains a significant challenge. The courts have often struggled with the implementation of their orders, particularly in cases where the authorities are reluctant or unable to take action. The hierarchical structure of environmental regulation, with the Central Pollution Control Board (CPCB) at the top and the State Pollution Control Boards (SPCBs) at the State level, sometimes leads to delays and coordination problems, particularly when responsibilities are shared between the Union and the States. In the post-COVID period, the rebound of pollution levels after the initial lockdown-phase improvement has highlighted the fragility of enforcement mechanisms and the extent to which regulatory gains are often context-specific rather than institutionalised.

The judiciary has attempted to address these challenges by issuing detailed directions and monitoring the implementation of its orders. In several cases, the Court has appointed task forces and monitoring committees to oversee the execution of its directions and to ensure that the authorities are held accountable. The Court has also recognised the importance of capacity building and technical expertise in environmental governance, and has directed the authorities to strengthen their monitoring and enforcement capabilities. Despite these efforts, the gap between legal potential and administrative reality remains significant, and the courts continue to grapple with the challenge of ensuring that their orders are effectively implemented.

The Impact of Judicial Interventions on Air Quality: The impact of judicial interventions on air quality in Indian cities has been mixed. In some cases, the Court's orders have led to significant improvements in air quality, particularly in Delhi, where the introduction of CNG as a cleaner fuel for public transport and the closure of highly polluting industries have contributed to a reduction in PM_{2.5} and other pollutants. In other cases, the Court's interventions have been more symbolic, with limited on-ground impact due to the challenges of enforcement and the complexities of urban governance. The Court's role in addressing air pollution as a public health crisis has been crucial in raising awareness about the issue, in shaping the legal framework for environmental regulation, and in holding the State accountable for its obligations under the Constitution. However, the effectiveness of these interventions ultimately depends on the willingness and capacity of the authorities to implement the Court's orders and to integrate environmental considerations into broader urban-governance frameworks.¹⁸

¹⁸ Lavanya Rajamani, 'Judicial Innovation and the Environment in India' (2000) 1 *Indian Journal of Environmental Law* 97

AIR QUALITY DURING THE COVID -19 PERIOD: LOCKDOWN- DRIVEN CHANGES AND POLICY IMPLICATIONS

The Lockdown as an Unplanned Environmental Test: The arrival of the COVID-19 pandemic in early 2020 led to unprecedented restrictions on economic and social life across India. Under the Disaster Management Act, 2005, the Central and State Governments imposed successive phases of lockdowns that brought much of industrial activity, construction, transport, and commercial operations to a near-halt. The immediate objective of these measures was to contain the spread of the virus, but an unintended side effect was a visible and measurable improvement in ambient air quality in many Indian cities.¹⁹ For weeks, residents reported clearer skies, reduced smog, and the temporary reappearance of once-invisible horizons.

From an environmental-law perspective, the lockdown period resembles an unplanned, large-scale experiment in air-quality management. The sudden reduction in anthropogenic emissions allowed scientists and policymakers to observe how urban air responds when vehicles, factories, and construction sites stop operating at their usual intensity. Satellite imagery, station-based monitoring, and epidemiological observations all recorded significant short-term changes, particularly in the concentration of fine particulate matter and certain gaseous pollutants. This chapter analyses those changes, examines how authorities responded legally and institutionally, and reflects on what the lockdown-era experience can teach us about the design and enforcement of environmental-and-public-health-oriented regulation in ordinary times.²⁰

Effects of COVID-19 on air pollution levels in India: The global slowdown associated with the COVID-19 pandemic was accompanied by a distinct reduction in anthropogenic emissions, with studies reporting an approximate 8.8% decrease in global CO₂ emissions in the first half of 2020 and notable declines in urban air-pollution indicators such as PM_{2.5} and NO₂ across regions like Europe and China. In India, detailed assessments of 16 major cities found an average 30–50% reduction in PM_{2.5} and roughly 52% reduction in NO₂-related AQI during the strict lockdown phases, with the most pronounced improvements in North Indian cities, where industrial- and traffic-driven emissions are the dominant sources. Work on Delhi,

¹⁹ Central Pollution Control Board, *Report on Air Quality during Lockdown 2020* (2020), available at <https://cpcb.nic.in/lockdownairquality>

²⁰ Muhammad Z. Sadiq Khan et al., 'COVID-19 Pandemic and Its Impact on Environment: A Review' (2021) *Environmental Science and Pollution Research* 180.

Mumbai, Kolkata, and Chennai documented cumulative reductions in PM_{2.5}, PM₁₀, SO₂, and NH₃ by about 49–73%, 17–63%, 15–58%, and 30–74%, respectively, while analyses of six mega-cities Delhi, Lucknow, Kolkata, Mumbai, Chennai, and Jaipur recorded an average final reduction of approximately 37.42% in PM_{2.5} AQI and 65.80% in NO₂ AQI, underscoring the extent to which the shutdown of industrial-activity and vehicular-traffic could swiftly lower health-relevant pollutants.²¹ This improvement was rooted in the near-cessation of vehicular exhaust and industrial-combustion, as traffic-related sources alone account for around 60% of the PM_{2.5} load in Delhi, with a combination of vehicular-exhaust, re-suspended dust, and industrial-combustion similarly driving pollution in cities such as Hyderabad. Satellite and ground-monitoring data corroborated these trends, showing substantial decreases in PM_{2.5}, PM₁₀, NO₂, CO, and SO₂ in many Indian urban centres, even though ozone exhibited more mixed behaviour across locations.

The empirical evidence thus demonstrates that rapid, short-term improvement in air quality is technically achievable once human-driven emissions are curtailed decisively, weakening the argument that air-pollution-control is necessarily a slow-moving-policy-project and instead highlighting the potential of well-enforced-regulatory-and-governance-levers to yield measurable public-health-relevant gains.

At the same time, epidemiological-literature shows that elevated PM_{2.5} and O₃ exposure significantly increases adult-mortality from cardiovascular and respiratory diseases, stroke, and lung-cancer, with air-pollution-related deaths reaching into the millions annually worldwide, and cardiovascular-mortality-linked-to-air-pollution representing a substantial share of the total burden. In India, higher baseline-PM_{2.5}-levels are associated with greater vulnerability and mortality during the COVID-19-outbreak, as each 1 µg/m³ increment in PM_{2.5} has been linked to higher infection-rates and death-rates in affected populations, and Indian cities with the sharpest improvement in air quality during lockdown experienced relatively lower-COVID-19-mortality than those with persistently-poor-air quality, reinforcing the notion that cleaner air operates as a public-health-co-benefit in pandemic-conditions.

However, as the strictly enforced-lockdown phases gave way to successive unlock-periods and the resumption of industrial-production, vehicular-mobility, and construction-activity, the initially-achieved-air-quality-gains began to erode, revealing a clear post-lockdown

²¹ Sachin D. Sharma et al., ‘Effect of Restricted Emissions during COVID-19 on Air Quality in India’ (2020) 728 *Science of the Total Environment* 138878.

pollution-recovery trend. Analyses comparing lockdown-period air-quality with subsequent-unlock-and-post-lockdown-phases show that PM_{2.5}, PM₁₀, NO₂, and AQI values steadily rose back toward or even exceeded pre-pandemic-levels in many Indian cities, including Delhi, Mumbai, Kolkata, and several rapidly-growing-urban-centres along national-highways. In some locations, model-based-projections-against-observed-AQI-values indicate percentage-increases-in mean AQI-on-the-order-of-over-100–200% once economic-activity normalised, suggesting that the State had been able to reduce pollution-temporarily but lacked the institutional-and-enforcement-mechanisms to sustain-those-gains under-ordinary-governance. These rebound-patterns, alongside documented increases in PM_{2.5} concentrations and AQI during the post-lockdown period, confirm that the lockdown era episode of cleaner air was largely an accident of crisis management rather than a structural correction of the underlying pollution system. In legal and-policy terms, this post lockdown recovery trend underlines the gap between the State's capacity to act in an emergency and its willingness to institutionalise equivalent regulatory stringency in the "new-normal"; it also underscores the need to convert the temporary baseline of improved air quality into enforceable public health standards, so that the brief-experience of cleaner-air does not recede from memory but instead becomes a normative-benchmark for future environmental and public health regulation.

Judicial and Executive Reactions during the Pandemic: The noticeable improvement in air quality during the lockdown did not go unnoticed by the judiciary and executive authorities. Several writ petitions were filed before the Supreme Court and various High Courts, urging the authorities to treat the lockdown-period experience as a policy lesson and to integrate at least some of the achieved air-quality levels into normal-governance planning. Petitioners argued that the State's constitutional obligation under Article 21 to protect life and personal liberty implied a duty to maintain reasonably clean air, particularly in the light of the demonstrable health benefits of reduced emissions.²² They pointed to the visible and measurable gains in air quality as evidence that the State had the practical capacity to protect public health if it chose to do so.

Courts, while acknowledging the environmental co-benefits of reduced emissions, generally refrained from converting the lockdown-era air-quality levels into a fixed legal standard.

²² *M.C. Mehta v. Union of India*, AIR 1987 SC 1086; *Vellore Citizens' Welfare Forum v. Union of India*, AIR 1996 SC 2715

Judgment-drafting tended to emphasise the exceptional and emergency nature of the pandemic-period conditions, and the judiciary was cautious about imposing binding numerical targets for air quality in the absence of broader statutory-and-policy revisions. Instead, the courts often encouraged the executive to view the lockdown experience as a policy insight and to strengthen existing instruments such as the Graded Response Action Plan (GRAP), the National Clean Air Programme (NCAP), and the National Green Tribunal framework.²³ The connective idea was that the emergency-driven improvement should inform, but not directly replace, the ordinary regulatory structure. Executive agencies also responded by producing reports and advisories highlighting the environmental side effects of reduced industrial and transport activity. The Central Pollution Control Board and several State-level authorities issued analyses that linked the drop in emissions to the suspension of specific economic activities.

However, these documents largely remained descriptive. They catalogued the changes in pollution levels, correlated them with lockdown timelines, and occasionally suggested that similar measures could be replicated through more systematic regulation, but they did not translate these observations into binding rules. In this sense, the pandemic-period air-quality gains were recognised as a policy insight, but not yet embedded into the statutory or quasi-statutory fabric of environmental-and-public-health-protection law.

Public Perception, Media Coverage, and Social Expectations: The visibly cleaner skies during the lockdown had a powerful psychological and social impact on urban residents. Many people reported that the improved air quality made outdoor spaces feel safer and more pleasant, at least for a short time. The media widely covered the “clean-sky” moment, often juxtaposing images of clear horizons with earlier photographs of smog-clogged cityscapes. Stories of children seeing stars at night for the first time, or residents catching distant mountain ranges that had long been hidden by haze, became symbolic markers of the environmental co-benefits of reduced economic activity.³⁷ Social media further amplified these narratives, turning the lockdown-period’s air-quality improvement into a shared public memory.

However, as pollution levels rebounded after the unlock, the same channels also carried a sense of frustration and scepticism. Citizens began to question why the State could abruptly improve air quality during a crisis but seemed unable to sustain similar conditions under normal

²³ Ministry of Environment, Forest and Climate Change, *National Clean Air Programme (NCAP)* (2019).

governance.²⁴ The gap between what was technically possible in a pandemic-driven shutdown and what was politically acceptable in everyday policy created a credibility crisis in environmental-and-public-health governance. The ‘clean air we saw during lockdown’ narrative became a powerful rhetorical device in public debate and, increasingly, in legal and policy discourse. From a constitutional and rights-based standpoint, this shift in public perception is significant because it redefines clean air from a distant aspiration to a temporarily realised standard that can be invoked as a normative benchmark.

Legal and Policy Lessons for the Future: The lockdown-period experience offers several key lessons for environmental-law-and-policy design in India. First, it demonstrates that rapid, short-term improvements in air quality are possible if regulatory and enforcement mechanisms are activated with sufficient resolve. The lockdown experience invalidates the idea that reducing urban air pollution requires decades of gradual technological change or enormous economic costs. Instead, it shows that decisive policy choices such as temporarily restricting traffic, industrial operations, and construction can yield measurable public-health-relevant outcomes. This insight supports the case for stronger, health-oriented air-quality standards that are not treated as distant policy goals but as near-term policy objectives.

Second, the rebound effect highlights the need to institutionalise temporary gains. The lockdown-era improvement lacked a stable legal and institutional anchor; it was contingent on the emergency-framework of the Disaster Management Act and the exceptional suspension of economic life. To prevent the recurrence of the same pattern, policymakers must embed such gains into statutory-and-policy structures. This could include tightening city-specific air-quality-management plans, enhancing monitoring and enforcement mechanisms, and setting time-bound emission-reduction targets that explicitly reference the lockdown-period data as a baseline. The existing constitutional-and-statutory framework, Article 21, the Air Act, the Environment Act, and the NGT Act, can be interpreted in a way that obliges the State to demonstrate a clear pathway toward achieving similarly low-pollution states in the future, at least for health-relevant pollutants.

Third, the experience of the pandemic underscores the importance of linking air-pollution regulation to public-health outcomes. Rather than treating air-quality standards as neutral technical benchmarks, the law can explicitly frame them as public-health targets aimed at

²⁴ Venter et al., ‘COVID-19 Lockdowns Cause Global Air Pollution Declines’ (2020).

reducing respiratory illnesses, hospitalisations, and premature deaths. The lockdown-period data provides a unique reference point for calibrating such standards, as it shows which pollutants and which emission sources can be most effectively controlled through targeted interventions. This approach would require integrating health-data analysis with ambient-monitoring and using epidemiological evidence to justify more stringent, health-protective norms.

Fourth, the lockdown experience highlights the interdependence of environmental regulation with urban-planning, transport-policy, and energy-policy. The reduction in traffic-related emissions during the lockdown demonstrated that cleaner transport systems, such as expanded public transport, non-motorised mobility infrastructure, and electric vehicles, can significantly improve urban air quality. Yet, these measures are often weakened or rolled back once economic activity resumes, and environmental considerations are subordinated to short-term growth and convenience. A more coherent legal-and-policy framework would treat air-pollution control not as an isolated environmental project but as an integral component of broader urban-development, climate-change-mitigation, and public-health-strengthening strategies²⁵

POST-COVID CHALLENGES: RECONCILING RECOVERY, GOVERNANCE, AND PUBLIC HEALTH

The “New Normal” and the Air-Quality Paradox: The gradual easing of pandemic-related restrictions in India marked the beginning of what is often described as the “new normal.” This period has been defined by an aggressive push for economic recovery, the reactivation of industrial and transport sectors, and the expansion of urban infrastructure. At the same time, the environmental-and-public-health-lessons of the lockdown have not been systematically converted into durable legal-or-policy reforms. The result is a disquieting pattern: although the economy has resumed its momentum, the brief air-quality-improvement observed during the lockdown is being undone, and pollution levels in major cities are either returning to or exceeding pre-pandemic baselines.²⁶

This chapter argues that the post-COVID period exposes the fragility of India’s environmental and public health governance. The crisis-driven reduction in emissions was a temporary

²⁵ Rajamani, ‘Air Quality Regulation and Public Health in India’ (2021) *Journal of Environmental Law*

²⁶ ‘Temporary Reduction in Daily Global CO₂ Emissions during the COVID-19 Forced Confinement’ (2020) 10 *Nature Climate Change* 647

aberration rather than a structural correction, because the underlying drivers of urban air pollution, industrial energy models, traffic-intensive transport systems, and sprawling construction activity remain largely unchanged. As the State prioritises GDP growth and fiscal recovery, environmental regulation often recedes into the background. The central challenge is therefore not technological, but political and institutional: how to design a post-pandemic recovery that does not compromise clean air and public health.

The Re-Emergence of Urban Air Pollution: Empirical data from major Indian cities indicates that, after the short-lived improvement during the lockdown, air-quality indicators have drifted back toward worrying levels. In cities such as Delhi-NCR, Mumbai, Kolkata, and Bengaluru, ambient concentrations of PM_{2.5} and PM₁₀ have returned close to or above their pre-pandemic averages. In North India, winter-season smog episodes have reappeared with similar intensity, affecting visibility, public-life, and the management of respiratory-diseases. The resumption of construction, higher vehicular traffic volumes, and the continuation of industrial and waste burning practices have collectively eroded the lockdown-era gains.

The re-emergence of high-pollution episodes is more than a seasonal recurrence; it reflects a broader governance failure. The State has demonstrated in an emergency that it can sharply reduce emissions, yet it lacks the sustained political will to maintain similar standards under normal conditions.²⁷ The post-pandemic phase thus reveals a pattern where temporary reductions in pollution are followed by a return to “business-as-usual” once the immediate pressure eases. This pattern underscores the need to move beyond episodic-crisis-management and to embed air-quality-protection into the ordinary-mechanisms of urban-governance.

Economic Recovery versus Environmental Regulation: One of the defining tensions of the post-COVID era is the perceived conflict between economic recovery and environmental regulation. Policymakers are under pressure to revive industrial-production, generate employment, and stimulate consumption, often at the cost of strict environmental-enforcement. In practice, this has sometimes taken the form of softened monitoring, delayed implementation of emission-norms, or reluctance to impose stricter conditions on large-industrial-units and infrastructure-projects. This approach treats environmental-laws as constraints on growth, rather than as essential components of sustainable-development.

²⁷ Sachin D. Sharma et al., ‘Effect of Restricted Emissions during COVID-19 on Air Quality in India’ (2020) 728 *Science of the Total Environment*.

From a constitutional-and-legal-perspective, this tension is artificial. Article 21, read with Articles 48-A and 51-A(g), obliges the State to protect the environment and the health of citizens, irrespective of the economic context. The Supreme Court has repeatedly interpreted the right to life to include the right to a clean environment and has recognised the principle of sustainable development, which demands that growth and environmental-protection proceed hand in hand. Yet, in the post-pandemic period, the State has often invoked the need for economic-recovery to justify the dilution of enforcement-actions, creating a situation where the legal framework appears robust on paper but is applied selectively in practice.

Addressing this challenge requires a re-framing of environmental-and-public-health-policy as integral to, not separate from, economic-planning. This means embedding emission-targets, health-impact-assessments, and environmental-cost-calculations into budget-discussions, urban-development-plans, and industrial-policy-design. Only then can the “new normal” become a genuinely sustainable-normal, rather than a return to purely growth-centric-governance.

Institutional and Enforcement Fragility: The post-pandemic phase has also highlighted the institutional-fragility of India’s environmental-enforcement-machinery. The Central Pollution Control Board and State Pollution Control Boards, despite their statutory powers, continue to grapple with understaffing, limited technical-capacity, and dependence on executive-budgetary-support, which can weaken their independence and resolve. In many States, the Boards are unable to conduct regular inspections, maintain real-time-monitoring, or respond promptly to citizen-complaints, which allows polluters to operate with minimal fear of sanctions. At the same time, the National Green Tribunal, though designed to expedite environmental-disputes, faces case-backlogs and difficulties in ensuring compliance with its directions.

The pandemic-induced fiscal stress has further constrained the State’s ability to strengthen these institutions. Instead of seizing the post-lockdown moment to expand monitoring networks, digitise compliance mechanisms, and enhance local enforcement capacity, many authorities have treated environmental spending as a discretionary item subject to cutbacks. This institutional-fragility ensures that even when the law provides a strong framework, its on-ground-impact remains weak. Bridging this gap requires not only increased

financial-and-technical-support but also measures to insulate pollution-control-institutions from short-term-political-and-economic-pressures.²⁸

Public Health and the Burden on Vulnerable Groups: The deterioration of air quality in the post-lockdown-period has real-health-costs, particularly for vulnerable populations. Fine particulate matter and gaseous-pollutants have been linked to higher rates of respiratory-diseases, cardiovascular-conditions, and hospital-admissions, especially among children, the elderly, and individuals with pre-existing-health-problems.²⁹ In Indian cities, the burden of air-related-ill-health falls disproportionately on lower-income-communities, who often reside in neighbourhoods closer to industrial-clusters, traffic-corridors, and construction-sites and have limited access to health care or protective-technologies such as air-filters or private transport.

The post-pandemic-phase also reveals that the health-system remains poorly equipped to integrate environmental-risk-factors into routine-medical-practice. Many hospitals and clinics treat respiratory-admissions as isolated clinical-events, without systematically linking them to long-term-exposure to polluted air. The absence of robust-health-data-collection on air-quality-related-morbidities further weakens the case for urgent regulatory-reform and public-investment in cleaner-energy-and-transport-systems. In this context, the State's failure to preserve lockdown-era-air-quality-gains can be understood as a form of structural-neglect, where the cost of pollution is shifted onto the most vulnerable while the benefits of industrial-and-economic-activity accrue to relatively-wealthier-groups.

Policy and Legislative Inertia: Despite the evidence of the lockdown-era-air-quality-improvement and its subsequent erosion, there has been limited policy-and-legislative-innovation in the post-pandemic-period. The Air (Prevention and Control of Pollution) Act, 1981, and the Environment (Protection) Act, 1986, remain the primary-legal-tools for regulating emissions, yet they have not been significantly amended to reflect the lessons of the pandemic. The National Clean Air Programme and the Graded Response Action Plan operate within their original frameworks, with only incremental adjustments rather than a fundamental re-design.

²⁸ Lavanya Rajamani, 'Public Interest Environmental Litigation in India' (2007) 23 *Journal of Environmental Law* 293

²⁹ World Health Organization, *Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease* (WHO 2016)

This legislative-inertia is notable given the availability of relatively-simple, evidence-based-measures that could reduce air-related-health-burden. These include the expansion of public-and-non-motorised-transport, stricter industrial-emission-norms, better management of construction-related-dust, and the regulation of crop-residue-burning and waste-burning. Technology-and-financing are not the primary barriers; the main obstacle is political-and-institutional-reluctance to enforce these measures consistently. The post-COVID-period, therefore, underscores the need to move beyond ad-hoc-commissariats and temporary-task-forces and instead embed air-quality-goals into statutory-targets and enforceable-institutional-obligations.

The Role of the Judiciary and Civil Society: The judiciary and civil society actors continue to play a crucial role in addressing post-COVID air quality challenges. Public-interest-litigation has historically been a key mechanism for pushing the State to strengthen environmental-protection and health-safeguards, and this function remains relevant in the current phase. Courts have used Article 21 and the precautionary-principle to issue directions for the introduction of cleaner-fuels, the closure or relocation of highly polluting-industries, and the formulation of city-specific-air-quality-plans. In the post-pandemic-context, such interventions can help ensure that the temporary-gains in air quality are not treated as anomalies, but as benchmarks against which the State's performance is measured.

Civil-society-organisations and citizen-groups also contribute by sustaining public-pressure, demanding transparency, and documenting the health-impact of pollution. The "clean-sky" memory from the lockdown provides a powerful-reference-point for advocacy, reminding policymakers that cleaner air is not a distant-dream but a temporarily-achieved-standard. NGOs and community-initiatives can support monitoring-efforts, facilitate public-participation, and bring grass-roots-perspectives into policy-discussions, thereby helping to counterbalance purely-economic-and-technocratic-approaches to recovery.³⁰

Data, Transparency, and Public Trust: Another critical challenge in the post-pandemic phase concerns data, transparency, and public trust. Although India has expanded its ambient monitoring network, coverage gaps, delayed data publication, and limited public access to real-time information undermine the legitimacy of environmental governance. In many cities, residents cannot easily obtain reliable information about local pollution levels or the

³⁰ Shibani Ghosh, 'Litigating the Right to Clean Air' (2019) 11 *NUJS Law Review* 1.

compliance status of industrial units, which weakens their ability to take precautionary measures or hold authorities accountable. Strengthening data systems and ensuring transparent reporting would not only support better policy design but also build public confidence in the State's environmental commitments.

CONCLUSION

Air pollution in India has evolved into a complex and deeply rooted challenge that extends far beyond environmental degradation, affecting public health, economic productivity, and the realisation of fundamental rights. This study demonstrates that India is not lacking in legal or policy mechanisms to address air pollution. On the contrary, the country has developed a comprehensive framework consisting of constitutional safeguards, statutory enactments, judicial principles, and policy initiatives. The interpretation of the right to life under Article 21 to include the right to a clean and healthy environment provides a strong normative foundation. However, the effectiveness of this framework is significantly weakened by persistent shortcomings in implementation, enforcement, and institutional coordination.

A key conclusion emerging from this study is the existence of a substantial gap between legal provisions and their practical application. Regulatory bodies such as Pollution Control Boards often face structural limitations, including inadequate funding, a shortage of trained personnel, and limited technological capacity. These challenges are further aggravated by administrative inefficiencies and, at times, competing political and economic priorities. As a result, environmental regulations are not enforced with the level of consistency and strictness required to bring about long-term improvements in air quality. This implementation deficit remains one of the most critical barriers to effective air pollution control in India.

The study also highlights the inherently multi-dimensional nature of air pollution. Unlike isolated environmental problems, air pollution arises from a wide range of interconnected sources, including industrial emissions, vehicular traffic, agricultural practices such as stubble burning, construction activities, and the use of solid fuels in households. These diverse sources operate across sectors and regions, making it difficult to address the problem through fragmented or sector-specific policies. The findings, therefore, emphasise the need for an integrated and coordinated governance approach that brings together environmental regulation, urban planning, energy policy, transport systems, and public health strategies.

Another significant conclusion is the strong linkage between air pollution and public health outcomes. Scientific and epidemiological evidence clearly establishes that exposure to polluted air contributes to a wide spectrum of diseases, including respiratory illnesses, cardiovascular conditions, and other long-term health complications. The burden of these health impacts is not evenly distributed; vulnerable groups such as children, the elderly, and economically disadvantaged populations face disproportionately higher risks. This raises important concerns regarding equity and environmental justice. It also reinforces the argument that access to clean air should be treated as a basic human right rather than a policy aspiration.

The role of the judiciary in shaping environmental governance in India has been both significant and transformative. Through Public Interest Litigation and progressive judicial interpretation, courts have expanded the scope of environmental rights, introduced key principles such as the precautionary principle and the polluter pays principle, and directed the implementation of various pollution control measures. These interventions have often filled gaps left by administrative inaction and have contributed to important policy changes. However, this study concludes that judicial activism, while necessary in certain contexts, cannot serve as a long-term substitute for effective executive action. Sustainable progress requires strong institutional mechanisms and proactive governance rather than reliance on court-driven solutions.

The COVID-19 lockdown period provided an unprecedented real-world example of how reduced human activity can lead to rapid improvements in air quality. The noticeable decline in pollution levels during this time demonstrated that significant environmental improvements are achievable within a short span when emissions are effectively controlled. However, the subsequent return of pollution levels to pre-pandemic conditions highlights the absence of structural reforms and long-term policy planning. This pattern underscores the need to transform temporary gains into permanent strategies through institutionalised regulation and sustained policy commitment.

In the post-COVID context, the study identifies a growing tension between economic recovery and environmental protection. Policymakers often perceive strict environmental regulation as a constraint on economic growth, leading to a relaxation of enforcement measures in favour of industrial and economic activities. However, this approach is short-sighted. Environmental degradation, particularly in the form of air pollution, imposes high economic costs in terms of healthcare expenditure, loss of productivity, and reduced quality of life. Therefore, the study

emphasises that economic development and environmental protection should not be viewed as conflicting objectives. Instead, they must be integrated within a framework of sustainable development that prioritises long-term well-being.

The findings also point to the need for greater transparency, public participation, and accountability in environmental governance. Access to accurate and timely air quality data is essential for informed decision-making and for empowering citizens to hold authorities accountable. Strengthening monitoring systems, promoting community involvement, and encouraging behavioural changes at the individual level can play a crucial role in addressing air pollution more effectively.

In conclusion, tackling air pollution in India requires a fundamental shift in approach—from fragmented and reactive measures to a comprehensive, coordinated, and preventive strategy. Strengthening enforcement mechanisms, enhancing institutional capacity, aligning legal standards with scientific evidence, and integrating environmental concerns into broader policy frameworks are essential steps in this direction. With sustained political will, improved governance, and active public engagement, it is possible to achieve meaningful progress in improving air quality. Ultimately, ensuring clean air is not only an environmental necessity but also a constitutional obligation and a moral imperative to safeguard the health and well-being of present and future generations.