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# Controlling Atmospheric Emissions from Chemical Plants under Indian Environmental Law

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## ABSTRACT

*This article looks at different legal frameworks and challenges regulating atmospheric emissions from chemical plants in India. As air pollution is a major problem in India, chemical plants, which emit a large number of pollutants in the air, must have strong legal regulation and control. In this context, the article discusses the evolution of environmental law and legal theories that underpin environmental regulation, and examines the legislations and regulations applicable to the industrial emissions. It further considers the role CPCB, SPCB, and EIA play in enforcing air quality standards, and some of the challenges that companies face in meeting their obligations. The discussion also looks at limitations of law, and access to justice, issues of technology and economics, and the need for a socio-economic balance in protecting the environment without halt to growth and development. It is concluded that the legal and policy framework needs continuous reform and movement to follow challenges of evolving pollution and the path of sustainable development.*

**Keywords:** Atmospheric Emissions, Chemical Plants, Air Pollution, CPCB, EIA, Sustainable Development

## I. INTRODUCTION

Shifting aspirations of industrial growth and scientific research have come to figure among the central problems of global ecology. Enter chemical plants. Much like what has been the fate of ecological conservation, industrial growth in India remains among the greatest problem areas of environmental law, especially in the post-colonial history of India. A postcolonial giant with an economy and industry that are still growing in astronomical fashion, India is home to ‘approximately 300 large, medium and small chemical plants manufacturing the whole range of industrial chemicals and oils that form part of the basic chemical industry.’ India’s chemical industry is an ‘outstanding’ feature of the country’s industrial scene and employment. India’s chemical industry, as most Indian industries, could rise amid declining fortunes of ecological

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conservation. In the post-independence period in India, ecological degradation organically became intimately associated with present-day chemical plants, which have come to be considered the chief architects of the present crisis of atmospheric emissions. This piece called ‘Airborne Alchemies: Controlling Atmospheric Emissions from Chemical Plants under Indian Environmental Law,’ is an attempt to understand the legal framework at the ‘core center’ of atmospheric emission control from chemical plants, evaluate the efficacy of such a framework, trace problems that such a framework promises to be susceptible to, and then suggest reforms of the operative legal framework.

In the last two decades, the second most populous and the fastest growing economy of the world, India has seen a rapid and substantial increase in a broad spectrum of industrial activities that serve as key drivers of its economic development. However, this economic boom and the population explosion have also been a cause of persistent and severe exposures to a broad class of atmospheric contaminants, which present severe hazards to human health and the environment. The atmospheric effluents from various industrial sources are a major source of air pollution in India, namely particulate matter, SO<sub>2</sub>, NO<sub>x</sub>, VOC and others in the atmosphere. Due to this air pollution, India continues to face a high health burden in terms of various respiratory disease (which is one of the leading causes of death in men and women), cardiovascular disease and, most importantly, the mortality among people of all age groups. This elevated incidence of disease has become an overwhelming need to curb the emissions under pollution-control limits. The chemical sector in India is one of the biggest industrial sectors, and it constitutes the major sector of industry-wise atmospheric emission in India. The chemical sector is one of the major point sources of pollution due to various chemical activities. In chemical processes and manufacture of chemicals, a large number of pollutants are produced and released in the atmosphere. Therefore, the activity that generates atmospheric emissions, involves a wide range of pollutants. These pollutants can cause serious issues related to air quality, ecosystems as well as to human health and quality of life if they are poured in to the atmosphere without proper control.

The Indian chemical industry is broadly categorized into five segments, viz basic chemicals, specialty chemicals, agrochemicals, petrochemicals, and fertilizers. These produce a wide variety of goods such as paints, adhesives and sealants, polymers, pharmaceuticals, synthetic resins, artificial fibers, plastics, synthetic rubbers, liquid crystals, bio-pesticides, crop protection chemicals, dyes and pigments, and insecticides and fungicides among several others. The chemical processes involved in the production of these compounds tend to be energy-intensive with a wide variety of pollutants released as by-products of the process. For example, fertilizer

manufacture leads to the generation of nitrogen oxides (NO<sub>x</sub>) and Sulphur dioxide (SO<sub>2</sub>), while volatile organic compounds (VOCs) find their way into the atmosphere in the production of plastics and synthetic fibers.

These compounds have collective environmental health impacts — greenhouse gases contribute to formation of ground-level ozone and acid rain, both of which have negative impacts on the respiratory systems of most kinds of living organisms. Therefore, the chemical industry has two huge contributions to air pollution. In light of this, it becomes very important to have strong regulation of the chemical industry in order to mitigate its environmental impacts.

## **II. THEORETICAL FRAMEWORK**

These emissions contain both inorganic and organic particulates, and VOCs (volatile organic compounds) into the atmosphere. Airborne transport of industrial emissions can have important impacts on nearby environments. Plant emissions may trigger weathering or air pollution, and may be major contributors to acid rain or a catalyst in global warming and ozone depletion. The particulate matter, including solid and liquid residue after industrial processes, toxic gases such as Sulphur dioxide (SO<sub>2</sub>), and nitrogen oxides (NO<sub>x</sub>) compose acid rain, marked as low pH and soluble salts. The falling acid rain can alter the chemical composition of surface waters, forests and soil, inhibit the growth of vegetation and biodiversity loss. Other industrial chemicals to react with VOCs and also a precursor of ozone include nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs). Ground-level ozone is one of the most important constituents of smog and can cause serious health problems such as lung inflammation, respiratory symptoms, and offer aggravation of pre-existing conditions such as asthma. Agriculture crops and plants had been suffered by ozone.

This is important for understanding the environmental consequences that can then be used as a basis in new legal or regulatory frameworks for controlling such emissions. The damaging effects emphasise the necessity to restrict the production of dirty industrial processes by monitoring and regulating chemical industries which contribute a significant portion of anthropogenic air pollution. This knowledge forms the basis of the relevant legal systems for environmental protection and maintaining air quality that is healthy and safe for the public and the environment.

### **1. The Principle of Sustainable Development in the Context of Industrial Emissions**

Although often designed with seeming arrogance to the very elements they are supposed to harness, they have been premised upon a highly futurist set of social and environmental values — a hallmark feature of environmental regulation today. Perhaps due to their enormous industrial

footprint and planet-transforming mission, the chemical industry in particular has long reasoned that the future will in fact always be green. This greening impulse can be summarized under the banner of sustainable development – the dominant structuring principle of environmental regulation since its inception. It seeks to square the development circle by simultaneously satisfying the needs of the present and the imperatives of the future, particularly as they relate to environmental health. The slogan of sustainable development is that mankind must learn to grow economically without growing environmentally. Nature must be used for purposes of development, including natural resource extraction, but in such a way that the natural environment remains intact and viable for further exploitation by future generations. When it comes to industrial emissions, this has meant that, at minimum, industries from chemicals must learn – as they have uniquely been compelled to do – to operate in such a way that considers their environmental footprint.

Among them, for instance, are cleaner production technologies, waste minimization, energy efficiency, and the use of alternative, less polluting substances in industrial operations, all approaches for applying the concept of sustainable development to controlling atmospheric emissions. ‘Sustainable development should be an integral part of the core of the production process, so that the chemical industry can continue to fulfil its functions as a backbone of the economy without sacrificing the quality of the air we breathe or harming people’s health.’

## **2. Legal Theories Underpinning Environmental Regulation**

The case law on setting legal constraints on emissions to the atmosphere is also based on several lines of legal arguments including the precautionary principle, the polluter pays principle, and the public trust doctrine.

The Precautionary Principle emphasises that environmental harm should prompt pre-emptive action, and that absence of full scientific certainty constitutes an insufficient reason to delay measures that prevent environmental harm. The Precautionary Principle is fundamental to industrial emissions risk management, and critical to the support of stringent regulatory standards, even when precise risks are unknown and the full scope of harm not yet clear.

In the Polluter Pays Principle, the polluter becomes responsible for preventing and mitigating pollution, meaning that the polluter must bear the costs of pollution. It justifies monetary fines and penalties as consequences of pollution, as well as inspiring regulation that makes polluters purchase pollution control technologies. It also emphasises the economic accountability of chemical plants for managing air emissions so that environmental costs of industry are internalized.

It holds that some natural resources remain in trust for public benefit and that the state has a corresponding public

### **III. INDIAN ENVIRONMENTAL LAW**

Over the past few decades, India's environmental legal framework has transitioned from sectoral disjointedness to a comprehensive, integrated approach towards protection of the environment. This shows that the State acknowledges environmental protection as crucial to its objective of sustainable development. Hence, while the common law developed cobweb law to control the discharges of chemical plants into the air, the constitution of 1950 provided for a full-blown procedural police power of state legislatures to pass laws that regulate atmospheric emissions of chemical plants.

#### **1. Historical Development of Environmental Law in India**

The initial seeds of an environmental law in India were sown during the British colonial period, but were limited to the provision of specific rules related to individual issues, such as forest conservation and wildlife protection. Serious efforts to develop a comprehensive environmental law in India began after the United Nations Conference on the Human Environment was held in Stockholm in 1972.

Legislation such as the Water (Prevention and Control of Pollution) Act of 1974, the Air (Prevention and Control of Pollution) Act of 1981, and the Environment (Protection) Act of 1986 were passed over the next two decades. The Air Act of 1981 represented a major leap forward in efforts to check atmospheric pollution of all kinds, including emissions from various industrial activities. This act provided the legal basis for enforcing ambient air quality standards as well as regulating prescribed pollutant emissions. The Environment (Protection) Act of 1986 further consolidated the legal avenues for tackling environmental problems by providing the strong arm of the central government with the legal mandate to take appropriate measures for the prevention and control of environmental pollution.

#### **2. Principles and Objectives of Environmental Legislation**

Finally, India's fundamental environmentalism is embodied in four principles that underpin our environmental laws – sustainable development, the precautionary principle (that one should err on the side of safety), the polluter pays principle (one who generates waste has a duty to dispose of it responsibly), and intergenerational equity (that environmental law must not deprive future generations of their entitlement to natural resources that we enjoy). These provisions have not been mere theoretical constructs.

The intended purposes of these regulations are varied. Such legislations should be able to prevent, control and reduce pollution of the environment, rational utilization of the environmental resources, and maintain the ecological balance. For specific purposes, the regulation of air should be able to manage the air quality and control emissions from industrial operations. Through these legal frameworks, an ideal harmony should be able to unfold on Earth between developing economy and environment, in order that while the former flourishes, the latter should not suffer from the detriment of ecological degradation.

### **3. The Role of the Judiciary in Shaping Environmental Law**

In India too, the judiciary has played the important role of evolving and enforcing environmental law, often acting to fill the gaps left by the legislature and the executive. Courts have made increased use of novel judgments to expand the purview and scope of environmental protection, to innovatively use constitutional provisions in novel ways, and to ensure the continuing power of public interest litigation (PIL).

Indeed, perhaps the most important precedent in environmental jurisprudence is *M C Mehta v Union of India* (1996), in which the Supreme Court directed firms in the Taj Trapezium Zone to switch to less-pollutant fuel, which was believed to be causing acid rain and protecting the Taj Mahal from acid rain. From this landmark case it can be inferred how the courts are allowing environmental law to protect historical buildings and health from environmental pollution from industrial sources.

The judiciary has also reiterated that the right to live with dignity under Article 21 of the Constitution includes the right to a clean and healthy environment, and thereby elevated environmental protection as a fundamental right, to bind the state and industrialists to adopt measures that mitigate environmental damage.

Moreover, as recently as 2019, courts have reaffirmed the importance of the precautionary principle and the polluter pays principle to environmental jurisprudence, requiring that industrial activities should not only remain within legal thresholds entirely, but should take prospective steps to undo environmental harm, and that those polluting industries bear the cost of environmental remediation.

As adjudicators, the judiciary has intervened indirectly, but no less powerfully, in shaping environmental law by making decisions on controversies of the day as well as by setting precedents for the future framing of legislative and policy initiatives. In explaining its decisions, the judiciary has consistently reinforced the need to balance economic development and environmental protection, and thereby helped make India's law suitably attentive to the

challenge of the control of atmospheric emissions, both from chemical plants and elsewhere.

#### IV. LEGISLATIVE FRAMEWORK GOVERNING ATMOSPHERIC EMISSIONS

This is because atmospheric emissions (including IEDs), being a multi-juristic emission, in particular, is a multi-tiered system of national and state laws and regulations. The framework addresses the various and complex challenges posed by industrial emissions (including fugitive emissions) on air quality. This includes emissions of industrial chemicals from chemical plants, which are among the biggest contributors to this phenomenon. We need to understand the key provisions and mechanisms of the laws to grasp how Indian environmental law can tackle atmospheric emissions.

##### 1. National Legislation

###### 1. *The Air (Prevention and Control of Pollution) Act, 1981*

Laid down to curb air pollution and preserve the quality of air, the Air (Prevention and Control of Pollution) Act of 1981 was India's first specific consolidated legislation tackling air pollution. Under the Act, the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) have been vested with countervailing powers and functional instruments to perform the Act.

Key Provisions:

- Learning Curve Mechanism: Industry needs to secure consent from the concerned State Pollution Control Board (SPCB) for starting or operating operations and the emission standards concerned;
- Process Mechanism: zero discharge/reuse of water/sludge.
- Emission Standards: The Act empowers the CPCB to stipulate standards for air quality and of discharge of pollutants into the atmosphere from industrial plants and automobiles.
- Preventive Action: It empowers SPCBs to issue directions under section 33 of the Act to any industry to undertake action to counter pollution which is beyond permissible limits.
- Penalties: In case of refusal to comply, the Act provides for closure of the plant, imprisonment and fine for the offender.

###### 2. *The Environment (Protection) Act, 1986*

The Environment (Protection) Act of 1986 is a master legislative act in this respect, aimed

generally at the protection and improvement of the environment. The act was created in the aftermath of the Bhopal Gas Tragedy, and the central government was allowed to take all such measures to supervise and control the performance of any industry, trade or enterprise whose operations are likely to cause environmental pollution.

#### 1. Applicability to Chemical Plants:

- **Standards for Emission:** The Act authorizes the center to issue standards on emissions and discharges of pollutants into air or water of chemical plants.
- **Control of Hazardous Substances:** The Act authorizes regulation of industrial processes and operating conditions that present hazardous substance risks. This provision directly affects the chemical industry.
- **Environmental Clearances:** Providing for environmental clearances for new projects or project expansion under the Environmental Impact Assessment (EIA) based on a prior environment impact assessment as a mandatory part of the planning and development process.

#### 3. *Role and Significance*

laws are necessary to adapt this law for local conditions and contexts The State Pollution Control Board in Uttarakhand, knowing that more water from Himalayan forests flowed downstream than flowed upstream, captured the state's specific environmental issues and priorities in terms of ground level implementations before the law was passed. These included preserving the state's high biodiversity, protecting water bodies and preventing industrial pollution in sensitive areas.

Case Studies of State-Level Implementation and Enforcement:-

- **Industrial pollution in the Ganga basin:** A leading case relating to the industrial practice is that of industrial effluents and emissions from the Ganga basin region, where best practicable means (BPM) norms have been introduced to curb pollution incidents and there have been important regulations by officials from the Uttarakhand Pollution Control Board, such as closure proceedings against units not complying with emission norms under the Air Act and the Environment Protection Act.
- **Eco-sensitive zones:** Uttarakhand has decided on specific eco-sensitive zones where industrial activities are regulated to minimize environmental degradation. Uttarakhand's policy initiatives in line with national legislation express its commitment to safeguard its natural heritage while balancing industrial growth.

The legislative framework on atmospheric emissions from chemical plants in India offers a holistic approach to safeguard the environment. It blends national and state laws and regulations, which not only stipulate the standards for emissions and corresponding penalties without compliance but also designate and allow the regulatory bodies to act on the laws. The rich provisions in the Air Act and Environment Protection Act combined with state-level legislations allow India to effectively regulate its atmospheric emissions to maintain a balance of industrialization and protection of the environment.

## **V. REGULATORY BODIES AND ENFORCEMENT MECHANISMS**

Underlying the effective enforcement of environmental regulations in India, particularly pertaining to atmospheric emissions from chemical plants, is a clearly defined scheme of bodies responsible for regulatory oversight, imbued with both powers and duties to ensure that the air quality standards are followed and that industrial activities conform to the norms laid down by environmental regulations. The roles and mechanisms of enforcement through the Central Pollution Control Board (CPCB), the State Pollution Control Boards (SPCBs), and the Environment Impact Assessment (EIA) are explored here within this aspect of the regulatory framework.

### **1. The Central Pollution Control Board (CPCB): Powers and Functions**

The CPCB, set up in 1974 under the Water (Prevention and Control of Pollution) Act of 1974 and further strengthened under the Air (Prevention and Control of Pollution) Act of 1981, is the country's apex body for the prevention, control and abatement of environmental pollution and functions under the Ministry of Environment, Forest and Climate Change (Merck), which is responsible to maintain and improve the country's environmental quality.

#### *1. Powers and Functions:*

- **Setting Standards:** One of the other most crucial functions of the CPCB is setting standards for air pollutant emissions from the industrial source like chemical plants, these standards are then enforced by the SPCBs.
- **Advisory Role:** CPCB acts as an adviser to the Central Government in all matters relating to water, air, and environment pollution control and eco-friendly and sustainable development. It also coordinates, assists and supports the state Pollution Control Boards (SPCBs) in the development and implementation of their plans and programmes.
- **monitoring and data collection:** the board is entrusted to supervise the situation of air quality in the country and collect data on the amount of environmental pollution. This

provides a basis for assessing implementation of environmental standards in society and formulating policies.

- **Research and Development:** Research and development of species-specific organisms, pollution clean-up technologies and ways of implementing control measures with greater efficacy and less human labor, are obvious activities of the CPCB.

## 2. **State Pollution Control Boards (SPCBs): Role in Enforcing Air Quality Standards**

SPCBs are created under the powers of the Water Act and Air Act, and are the primary state-level enforcement arm of the regulations. Their job is to implement environmental laws and regulations within the states, and make sure that chemicals or any other pollutants factories dispose of are dealt with according to regulations.

### 1. *Role in Enforcing Air Quality Standards*

2. **Grant of Consents:** SPCBs grants consent to establish and consent to operate upon ascertainment that industrial unit is installed and operated in accordance with the environmental performance standards.
3. **Supervision and Monitoring:** An SPCB periodically inspects and monitors industrial units, checks the actual working of pollution control measures and detects the validity of key data submitted by the industries.
4. **Prosecution:** SPCBs issue closure if units do not comply – shutting the erring unit, charging fine, referring for prosecution and so on.

### 2. *Environmental Impact Assessment (EIA) Process: Requirements for Chemical Plants*

Significantly, the granting of the EIA process is the mechanism through which any industrial project, including a chemical plant, gets the green light to go ahead – regulated by the Environment (Protection) Act of 1986 and associated EIA Notification of 2006. This stipulates public consultation processes, along with disclosure of information.

### 3. *Requirements for Chemical Plants:*

- **EIA Report Submission:** The EIA report must be prepared by project proponents, providing a description of the results of the study of the proposed project, including the identification, assessment and mitigation of the potential effect of the proposed project on the environment.

- Stakeholder consultation: this includes public hearings to hear the concerns and recommendations of communities (better-affected community) regarding the project.
- Appraisal and Approval: the findings of the EIA report and the result of the public consultation are assessed by an Expert Appraisal Committee (EAC) who decides the fate of the project – recommending it to the ministry (or not) based on the environmental impacts.

However, entrenched corruption in local and state bureaucracies, along with chronic understaffing and undertraining among civil servants and police officials, meant that implementation in the field was never going to be easy. The CPCB, the state pollution control boards (SPCBs) and the EIA process together gave India what was, arguably, the world's first modern regulatory regime for reducing atmospheric emissions from chemical plants. That is, it provided regulatory institutions which were capable of ensuring that industrial development happened in a fashion that reconciled economic expansion with environmental protection; namely standard setting, monitoring, enforcement and public engagement.

## **VI. STANDARDS AND GUIDELINES FOR ATMOSPHERIC EMISSIONS**

The legislative regime on air emissions control in India is governed by high-level tools that include: a generic set of standards and guidelines for industrial emissions (from chemical industry, hazardous waste handling and so on); National Ambient Air Quality Standards (NAAQS); and emissions standards for chemical industries, Best Available Techniques.

### **1. National Ambient Air Quality Standards (NAAQS)**

National Ambient Air Quality Standards (NAAQS) are the criteria against which air quality in India is measured. The Air (Prevention and Control of Pollution) Act of 1981 provided for the setting of standards in relation to air quality and their enforcement by the Central Pollution Control Board (CPCB). The main objective of the NAAQS is to prescribe the maximum permissible limits of pollutants in ambient air, including particulate matter (PM10 and PM2.5), sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, ammonia and other gaseous contaminants. NAAQS are used for monitoring and management of air quality in different states, and is the scientific basis for air pollution management for control measures and interventions.

The NAAQS are designed to 'protect public health and the environment', an intention that's enshrined in law and guides agencies that oversee and implement them. The standards serve as caps to prevent concentrations of each and every single pollutant from reaching levels at which

they could harmful to people and to plants and animals, not unlike the health systems we have for medicines in our bodies. Each year, threshold limits are adjusted as science identifies and explains more about how we may be damaged by air pollution.

## **2. Emission Standards for Chemical Industries: An Analysis**

Emission standards for the chemical sector in India are laid down in the Environment (protection) Act, 1986, as well as by the CPCB, based on the nature of industry. Such standards are an important regulatory tool for control of chemicals to the atmosphere as a byproduct of chemical manufacturing. Standards cover various categories of substances such as volatile organic compounds (VOCs), hazardous air pollutants (HAPs) and specific chemicals that are either used or produced during manufacturing.

The emissions standards are designed to encourage the use of technologies and management practices whose application minimises emissions. The level of the standards varies according to the type of operation, the scale of the plant, the nature of the chemistry involved, and the potential impact of the emissions on the environment. Adherence to the emission standards is legally mandated for any chemical plant and violation of the standards may invite penalties, which could include fines, shutdowns of the plant and litigations. These standards have subsequently resulted in substantial improvement in ambient air quality in surroundings of industrial zones. Today, the real weakness is in the enforcement of standards and monitoring compliance. Ensuring that there is compliance with emission standards will help enhance the effectiveness of emission standards as a remedy to atmospheric pollution from chemical industries.

## **3. Best Available Techniques and Their Adoption in India**

Best Available Techniques, which means the most effective and advanced means of preventing or reducing emissions and other environmental impacts, taking into account the best available scientific knowledge and the most effective techniques currently used by operators in analogous processes, together with economically viable techniques already applied in other processes or industries. An analogous process is one that uses similar materials and generates similar environmental impacts. In practice, that means processes that, in the assessors' judgment, are roughly the same. BAT is one of the key concepts in environmental regulation in many countries, evolving continuously through technological change and deeper understanding of environmental effects.

In India, adoption of BAT in chemical process industries is incentivized through environmental regulations and through policy measures that promote cleaner production technologies and

practices and facilitate the adoption of those technologies and practices that achieve compliance with emission standards, while also enhancing operational performance and competitiveness. This includes not only adoption of frontier pollution control technologies but also process and product, resource efficiency and waste minimization measures.

The legal basis for BAT in India is found in the Environment (Protection) Act 1986, along with the rules and guidelines framed under it. The environmental impact assessment (EIA) process allows BAT to be integrated within the process of granting clearances to new projects or expansions of projects. Environmental clearance is contingent upon the use of BAT to minimize environmental impacts.

However, BAT faces many challenges to its wider adoption in India, especially, large cost of implementation, lack of awareness and technical knowhow of BAT principles and technologies, and use of best available end-of-pipe technologies by smaller units. Major challenges to promote use of BAT in the chemical industry include financial incentives for cleaner technology adoption, capacity building and training programs, and technical collaboration. Challenges associated with Atmospheric Emissions Control.

Whether it is conventional or stringent, controlling atmospheric emissions through chemical plants carries multiple challenges within environmental law in India. These multi-dimensional challenges do not always help in effective regulation of atmospheric emissions and instrumental in giving more weightage to environment and industry balance as required under environmental law in India. This section tries to explain these multi-dimensional challenges driving the effective management of atmospheric emissions.

## **VII. COMPLIANCE CHALLENGES**

### **1. Technological and Financial Barriers**

The ambitious remission of atmospheric emissions is also hampered by the technological (and associated financial) limitations of industries. The swift adoption of the best available technologies for pollution control, while highly desirable, requires considerable investment in research and development, as well as equipment and human resources training, especially for the SMEs.

In addition, there is an ever-threatening risk that innovation will quickly outpace regulatory standards, creating a constant need for investment just to stay in compliance. It is a dynamic that can put an enormous financial strain on industries that might well be deterred from prudent environmental protections altogether.

## **2. Overlapping Laws and Regulatory Frameworks**

These laws, regulations and guidelines form the base of India's environmental legal regime. While legally complete, this structure also tends to be legally fragmented, a situation of overlapping and divergent regulatory requirements. For affected industries, this sets up confusion about the legal regime that they are subject to; for regulatory authorities, this makes the unravelling and solving of conflicts a cumbersome legislative and judicial exercise. For instance, as already discussed, both the CPCB and the SPCBs have concurrent jurisdiction over certain aspects of pollution control, often leading to multiple and sometimes conflicting additional requirements that handicap effective administration and enforcement.

## **3. Lack of Specificity in Standards for Certain Pollutants**

A further problem is that some standards are too generic for certain pollutants, particularly those that have recently been recognized as worries. Since standards are generic emission standards has ever required that standards be reviewed periodically to meet emerging science and technology.

## **4. Balancing Economic Growth with Environmental Protection**

The perpetual tension between furthering economic growth and protecting the environment continues. Economic development and electoral pressures can prevent governments from enacting environmental measures that might hinder economic growth in the short term, regardless of their merits in the longer term. As a consequence, it is often export-led industrialization and economic development that gets prioritized at the expense of the environment, proving politically and socially challenging to implement stringent environmental measures in localities where industries are a major source of employment and a key revenue generator.

## **5. Public Awareness and Participation in Environmental Governance**

Public awareness and participation are important for the proper governance of the environment. If people are not aware of how important it is to control atmospheric emission and the rights to enjoy the benefits of having a clean environment, it will be difficult for public participation in the decision-making process to promote a healthy environment. Furthermore, due to insufficient information, high requirement for bureaucratic paperwork in participation of public hearing or difficulties in understanding the complex issues between environment and people, public participation will be ineffective for the environment. In order to solve those barriers, public awareness should be increased and make it easier for people to take part in the process of environmental governance.

## VIII. CONCLUSION

This article delves into the nuances of the regulation of air pollution originating from the chemical industry in India, the industry of which is vital to the economic development of India. However, the industry is a prime example of the conflicting trajectory of modern industrialism and its potential for immense atmospheric emissions making it a crucial challenge to the cause of environmental protection. The trajectory of regulation through primarily the legal frameworks, enforcement mechanisms, and the challenges to controlling pollution are the essence of the discussion.

Considering the historical route through which India has arrived at its current environmental regulatory structure, what used to be a patchwork of sector-specific legislation has gradually become an integrated system of law to promote sustainable development. Thus, commencing from the Air (Prevention and Control of Pollution) Act of 1981, which addresses air pollution from stationary and automotive sources, and the Environment (Protection) Act of 1986, which created a polluter pays principle and empowered the Central Pollution Controller (erstwhile a part of the Ministry of Industry and later transformed into the CPCB) as well as the state or SPCBs, to courts and tribunals as envisaged under these legislations, environmental law has laid down a progressive body of precedents. The result is modern environmental regulation in India, identifying clean air as a fundamental human right and an essential element of health building. The principles of sustainable development, the precautionary principle and the polluter pays principle laid the foundation for designing sustainable development instruments and for underlying industrial objectives with environmental sustainability.

Judicial intervention in the field of environmental law, through landmark cases expanding the scope of environmental protection and reaffirming the right to clean and healthy environment as a part of the Right to Life under Article 21 of the Indian Constitution, has played a crucial role – not just in addressing immediate concerns but also in setting legal precedents that channel future legislation and policy-making by requiring a balance between development and environment.

Despite a strong legal framework and the role of the regulatory bodies, there are significant challenges in controlling atmospheric emissions from chemical plants in India. The technological and financial barriers to the use of sophisticated pollution control technologies, especially for small and medium enterprises, are very high. The legal and regulatory framework with pervasive overlapping laws and generality of emission standards for certain pollutants make compliance and enforcement very complex. At the socio-economic level, tension between

industrialization and environmental protection, lack of public participation in environmental governance and low environmental awareness are prominent.

It requires a holistic approach that makes provision for continuing evolutions in the law and in policy to reflect emerging environmental priorities and emerging technologies; that focuses greater attention on enforcement, and that makes better provision for specificity, precision and amplification in the authoritative formulation of limits on emissions and methods of their control; that increases public awareness and engagement in environmental issues; and that improves cooperation between the state, industry and civil society to encourage the adoption and use of cleaner technologies and practices.

Finally, the course towards achieving meaningful regulation of atmospheric emissions from chemical plants through Indian environmental law is just beginning. It requires much more than just a strong regime of legal and administrative obligations – it also requires an ethic that embraces what can be called an ideal of sustainable development. By periodically updating legal standards so that they never become stale, by pushing for cutting-edge technologies, and by making concerns for the environment part of mainstream public life, it is possible for India to square its eventual growth with growing planetary concerns over climate change and pollution.

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## IX. REFERENCES

1. Tegtmeier, S., Marandino, C., Jia, Y., Quack, B., & Mahajan, A. S. (2022). Atmospheric gas-phase composition over the Indian Ocean. *Atmospheric Chemistry and Physics*, 22, 6625-6676. <https://doi.org/10.5194/acp-22-6625-2022>
2. Beniwal, R. (2014, June 17). Laws Relating to Prevention of Air Pollution in India – Part I. Retrieved from <https://moef.gov.in/wp-content/uploads/wssd/doc2/ch2.html>
3. IEA. (2021). Air quality and climate policy integration in India. *International Energy Agency*. <https://www.iea.org/reports/air-quality-and-climate-policy-integration-in-india>
4. Environmental Law: Law Relating to Air Pollution. Retrieved from <https://www.bbau.ac.in/dept/Law/TM/6.pdf>
5. Gabrielli, P., Rosa, L., Gazzani, M., Meys, R., Bardow, A., Mazzotti, M., & Sansavini, G. (2023). Net-zero emissions chemical industry in a world of limited resources. *One Earth*, 6(6), 682-704. <https://doi.org/10.1016/j.oneear.2023.05.006>
6. Lee, B. K., & Cho, S. W. (2003). Strategies for emission reduction of air pollutants produced from a chemical plant. *Environmental Management*, 31(1), 42-49. <https://doi.org/10.1007/s00267-002-2789-1>
7. Wang, L., Lin, D., Liu, R., Li, J., & Xu, X. (2023). Emissions and Control Assessment of Volatile Organic Compounds from a Typical Chemical Enterprise. *Atmosphere*, 14(206). <https://doi.org/10.3390/atmos14020206>
8. European Environment Agency. (2024, March 20). Total greenhouse gas emissions in the chemical industry. <https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/total-greenhouse-gas-emissions-in-the-chemical-industry>
9. Lim, X. (2021, November 22). Chemicals industry pollution emissions climate. *The Guardian*. Retrieved from <https://www.theguardian.com/environment/2021/nov/22/chemicals-industry-pollution-emissions-climate>
10. Guttikunda, S. K., & Jawahar, P. (2014). Atmospheric emissions and pollution from the coal-fired thermal power plants in India. *Atmospheric Environment*, 92, 449-460. <https://doi.org/10.1016/j.atmosenv.2014.04.057>
11. Perrino, C., Tiwari, S., Catrambone, M., Dalla Torre, S., Rantica, E., & Canepari, S. (2011). Chemical characterization of atmospheric PM in Delhi, India, during different

- periods of the year including Diwali festival. *Atmospheric Pollution Research*, 2(4), 418-427. <https://doi.org/10.5094/APR.2011.048>
12. Air pollution and atmospheric chemistry in different environments of India. Retrieved from <https://www.indiascienceandtechnology.gov.in/listingpage/air-pollution-and-atmospheric-chemistry-different-environments-india>
13. Guttikunda, S. K., & Jawahar, P. (2014). Atmospheric emissions and pollution from the coal-fired thermal power plants in India. *Atmospheric Environment*, 92, 449-460. <https://doi.org/10.1016/j.atmosenv.2014.04.057>
14. Mittal, M. L. (No publication year). Estimates of Emissions from Coal Fired Thermal Power Plants in India. Retrieved from <https://www3.epa.gov/ttnchie1/conference/ei20/session5/mmittal.pdf>

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