
Cultural Traditions and Environmental Rights: A Discourse on Firecracker Use during Diwali

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Abstract

This study looks at the conflict between the use of firecrackers during Diwali and the right to a clean and healthy environment in India. Firecrackers cause serious air and noise pollution for a short period. During Diwali, air pollution levels often become ten times higher than safe limits. Noise levels can reach up to 140 decibels. Firecrackers release harmful chemicals and heavy metals into the air. These substances are dangerous to human health. They also affect animals. Birds and animals become stressed, confused, and injured. Many pets and urban wildlife suffer during this period. Indian courts have interpreted Article 21 of the Constitution to include the right to a clean environment. Despite this, the enforcement of rules is weak. Regulations such as the use of “green crackers” and limits on bursting time are not followed properly. Cultural traditions and poor monitoring are major reasons for this failure. This review supports a balanced approach. It suggests combining scientific knowledge with legal principles. The aim is to respect cultural practices while protecting the environment and ensuring animal welfare.

Keywords: Diwali firecrackers, Environmental pollution, Right to clean environment, Animal welfare

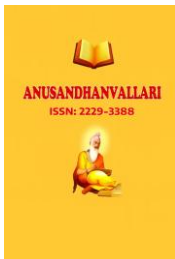
1. Introduction

1.1 Factual Background

Diwali is one of the most significant cultural and religious celebrations in India and known as the Festival of Lights. Traditionally, the festival symbolises the victory of light over darkness and good over evil. Across the country, people illuminate their homes with lamps, exchange sweets, and burst firecrackers as part of the festivities. Over time, the use of firecrackers has become deeply ingrained in Diwali celebrations, often seen as a symbol of joy and grandeur. However, this widespread practice has also emerged as one of the leading contributors to short-term but severe air and noise pollution across Indian cities.

Empirical data show that during the Diwali period, air quality in major urban areas deteriorates sharply. Studies conducted in Delhi, Mumbai, Kolkata, and Lucknow have shown that particulate matter (PM_{2.5} and PM₁₀) levels rise up to ten times higher than the permissible limits set by the Central Pollution Control Board (CPCB) (PTI 2021). In Delhi, for instance, PM_{2.5} concentrations frequently exceed 900 µg/m³ during Diwali night, compared to the safe limit of 60 µg/m³. Firecracker emissions release not only particulate matter but also heavy metals such as barium, strontium, and aluminum, and gases such as sulfur dioxide and nitrogen oxides. These pollutants linger in the atmosphere for several days, leading to respiratory ailments, cardiovascular stress, and aggravated asthma in vulnerable populations.

Noise pollution during Diwali also exceeds safe thresholds. Sound levels often surpass 125 decibels (dB), well above the prescribed limit of 55 dB for residential areas. Such noise affects not only humans but also causes stress, disorientation, and hearing impairment in animals and birds. Zoological studies report that sudden loud bursts disrupt feeding and nesting patterns of urban wildlife and companion animals exhibit anxiety and fear responses. Thus, while Diwali remains a culturally important celebration, its environmental consequences raise significant ecological and legal concerns.



1.2 Problem Statement

The central issue lies in reconciling two seemingly conflicting fundamental rights i.e. the right to practice one's culture and religion, and the right to live in a clean and pollution-free environment. The bursting of firecrackers during Diwali embodies this conflict. On one hand, it represents a time-honoured cultural practice rooted in religious expression and communal joy; on the other, it generates air, noise, and chemical pollution that endangers public health, disturbs animal life, and degrades ecosystems.

The challenge intensifies when viewed through the legal and regulatory lens. There exists several statutory mechanisms, including the Environment (Protection) Act, 1986, the Air (Prevention and Control of Pollution) Act, 1981, and the Noise Pollution (Regulation and Control) Rules, 2000 (Divan & Rosencranz, 2022). Despite these laws, enforcement during festivals remains inconsistent. The Supreme Court of India and various High Courts have, over the years, attempted to restrict or regulate the use of firecrackers, even mandating the introduction of "green crackers." Yet, the cultural sentiment and the lack of effective on-ground monitoring often weaken compliance. Consequently, the debate continues on how to harmonize environmental protection with cultural freedom while ensuring both human health and ecological balance (Ghosh et al., 2022).

1.3 Brief Literature Survey

Environmental science literature provides substantial evidence of the adverse effects of firecracker emissions on air quality and ecological systems. Empirical studies consistently show that Diwali firecrackers cause severe short-term deterioration of air quality in Indian cities. Chhabra et al. (2020) observed sharp increases in PM_{2.5}, PM₁₀, black carbon, and aerosol optical depth, affecting radiative properties and urban climate. Yerramsetti et al. (2013) confirmed recurring pollution spikes in Hyderabad over three consecutive years, identifying fireworks as a dominant source. Similar trends were reported in Delhi and other cities, where Mandal et al. (2012), Singh et al. (2010), and Thakur et al. (2010) documented abrupt rises in particulate matter, toxic aerosols, and noise levels during Diwali nights. Long-term analysis by Ravindra et al. (2022) showed that the 2020 fireworks ban led to measurable reductions in PM_{2.5} and PM₁₀ across the Indo-Gangetic Plains. Ghosh et al. (2024) further highlighted increased health risks during Diwali using the Health Air Quality Index. Collectively, these studies justify regulatory intervention to protect public health and the environment.

From the legal perspective, Indian judiciary has progressively expanded the interpretation of Article 21 of the Constitution to include the right to a clean and healthy environment. Cases such as *Subhash Kumar v. State of Bihar* and *M.C. Mehta v. Union of India* have reinforced environmental rights as integral to the right to life. The Supreme Court's decisions in *Arjun Gopal v. Union of India* (2017) and subsequent orders have attempted to regulate firecracker use. This reflects judicial acknowledgment of the environmental-cultural tension. Legal scholars have discussed this intersection extensively, focusing on balancing, proportionality, and the polluter-pays principle. Despite such discourse, comprehensive integration of environmental science findings with legal reasoning remains limited, particularly concerning impacts on animals and ecological systems (Tiwari, 2025).

1.4 Scope and Justification of the Work

This study aims to bridge the gap between environmental science and legal scholarship by presenting an integrated review of the ecological and legal dimensions of firecracker use during Diwali. The justification for this interdisciplinary approach lies in the observation that most prior works focus either on pollution statistics or legal compliance but seldom synthesise both within a unified analytical framework. Recognising that the right to environment and the right to cultural expression coexist under the Indian constitutional scheme, a nuanced exploration is essential to suggest balanced solutions.

The scope of the present work is confined primarily to the Indian context, with occasional comparative references to international festival regulations. It specifically examines the environmental impact of firecrackers on human health, animals, and ecosystems while assessing the adequacy of India's legal and regulatory responses. The



discussion evaluates statutory provisions, judicial pronouncements, and enforcement challenges, identifying lacunae in existing frameworks.

The proposed contribution of this review is to develop a legal–environmental framework for balancing cultural practices with the fundamental right to a pollution-free environment. By combining empirical evidence from environmental studies with legal reasoning, the paper seeks to offer policy recommendations that promote sustainable celebration practices, uphold environmental justice, and strengthen legal accountability in India.

2. Materials And Methods / Review Methodology

2.1 Review Methodology

Literature Search Strategy

This paper adopts a multidisciplinary review approach that integrates environmental science, and legal analysis. The literature search was conducted using both scientific and legal databases to ensure a comprehensive understanding of the subject. Major databases consulted include Scopus, Web of Science, Google Scholar, PubMed, and ResearchGate for environmental and zoological studies, and SCC Online, Manupatra, HeinOnline, and Indian Kanoon for legal and judicial materials.

The primary keywords used were: “firecrackers”, “Diwali”, “air pollution India”, “noise pollution Diwali”, “wildlife impact firecrackers”, “right to clean environment India”, “firecracker regulation India”, “animal welfare pollution”, and “Supreme Court firecracker judgments”. Boolean combinations (AND/OR) were employed to refine searches and identify cross-disciplinary linkages.

Inclusion criteria included peer-reviewed articles, reports, and judgments published between 2005 and 2025, written in English, and focusing on the Indian context. Studies were selected that addressed either (a) environmental or zoological effects of firecrackers, or (b) legal and constitutional analysis of environmental rights and cultural freedoms. Exclusion criteria eliminated duplicate studies, non-peer-reviewed commentaries without empirical or legal basis, and articles unrelated to Diwali or the Indian context.

2.2 Data Extraction and Synthesis

The review followed a structured extraction process. For scientific literature, relevant data on air pollutants (PM_{2.5}, PM₁₀, SO₂, NO₂, CO, and heavy metals such as lead, barium, and copper), noise pollution levels, and toxic residues were systematically recorded. Zoological studies were reviewed for parameters such as animal injury reports, bird mortality rates, stress or behavioural alteration in pets and wildlife, and ecosystem disturbances during Diwali.

For the legal dimension, the review relied on doctrinal legal research methodology, focusing on primary and secondary sources. Primary sources included constitutional provisions, environmental statutes (e.g., the Air (Prevention and Control of Pollution) Act, 1981; Environment (Protection) Act, 1986; Noise Pollution Rules, 2000), and judicial decisions (notably *Arjun Gopal v. Union of India*, *In Re: Noise Pollution*, and others). Secondary sources included scholarly commentaries, law review articles, and policy reports (Divan & Rosencranz, 2022)..

The legal analysis adopted a rights-based analytical framework, grounded in Article 21 of the Constitution (right to life and clean environment), Article 25 (freedom of religion and cultural practice), and judicially evolved environmental principles — including the precautionary principle, polluter pays principle, and sustainable development.

Findings from both streams i.e. environmental and legal, were then synthesised to highlight intersections, contradictions, and policy gaps.



2.3 Limitations of Methodology

Despite its interdisciplinary scope, this review faces certain methodological constraints. Empirical zoological data specifically linking firecracker use to animal health in India remain limited, with few long-term studies available. Temporal and geographic variations in data collection (e.g., studies confined to urban centres like Delhi or Mumbai) may restrict generalizability.

In the legal domain, while multiple judgments address air and noise pollution, relatively few directly discuss animal welfare or ecological dimensions in the context of cultural festivities. Moreover, enforcement-related data — such as actual compliance with judicial bans or restrictions — are often unavailable or inconsistently reported.

Finally, the integration of cross-disciplinary data (scientific, legal, and ethical) presents interpretive challenges, as methodologies and terminologies differ across fields. Nevertheless, the review attempts to bridge these gaps through careful comparative analysis and synthesis of available evidence.

3. Results And Discussion

3.1 Environmental Findings

3.1.1 Emissions from Firecrackers: Particulate Matter, Heavy Metals, and Chemical Composition

Multiple scientific studies confirm that firecracker combustion during Diwali contributes to severe but short-term spikes in air pollution across Indian cities. Data published in Science Direct, arXiv, and Research Gate indicate that concentrations of PM_{2.5} and PM₁₀ during Diwali nights often rise five to eight times higher than permissible limits. For instance, Delhi's average PM_{2.5} levels during Diwali 2022 exceeded 500 µg/m³, far above the 60 µg/m³ limit prescribed by the National Ambient Air Quality Standards (NAAQS). Similar trends have been documented in Mumbai, Kolkata, and Lucknow. The primary pollutants include sulphur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and heavy metals such as lead (Pb), barium (Ba), copper (Cu), and strontium (Sr), released from the metallic salts used to produce colours and light effects. These metals persist in the atmosphere and eventually deposit on soil and vegetation, entering food chains and posing toxicological risks to humans and animals alike.

In response to judicial intervention, particularly after the 2017 Supreme Court directives, the Council of Scientific and Industrial Research (CSIR) introduced “green crackers” — supposedly less polluting alternatives that use reduced levels of barium and avoid banned chemicals such as lithium, arsenic, antimony, and mercury. However, comparative analyses (Business Standard, 2021; arXiv, 2022) reveal that even “green crackers” still emit considerable amounts of particulate matter and metal oxides, with only 25–30% lower emissions relative to conventional ones. Thus, the “green” label is largely relative rather than absolute, reflecting a mitigation rather than elimination strategy.

3.1.2 Impact on Animal Welfare, Wildlife, and Ecosystems

The acoustic and chemical dimensions of Diwali pollution extend beyond human health, affecting animals and broader ecosystems. Studies on noise pollution reveal that typical Diwali firecrackers generate sound levels between 120–140 decibels (dB) — well above the 75 dB night-time limit prescribed under the Noise Pollution (Regulation and Control) Rules, 2000. Such high decibel exposure causes acute stress, disorientation, and hearing impairment in both domestic pets (dogs, cats) and urban wildlife (birds, bats, and rodents). Veterinary hospitals report annual spikes in cases of panic-induced injuries, respiratory distress, and sudden cardiac events among pets during Diwali nights. Field observations from zoologists (ResearchGate, 2020; ScienceDirect, 2021) suggest that avian species exhibit erratic flight patterns, abandoning nests due to sudden noise bursts and light flashes. Nocturnal species such as owls and bats suffer disrupted foraging and navigation due to the combination of light glare and sound shockwaves. Chemically, fine particulates and metal oxides settle on water bodies and soil, altering pH levels and contaminating vegetation. These residues can impair amphibians' respiration and



contaminate food sources for herbivores. While India-specific toxicological data are limited, analogous studies from Europe and Southeast Asia confirm that heavy metal inhalation and ingestion can suppress immune responses and disrupt reproductive cycles in birds and small mammals. The ecological chain thus faces indirect, cumulative stress during and immediately after Diwali.

3.1.3 Temporal and Spatial Patterns of Pollution during Diwali

Empirical data show that the air quality decline during Diwali is not uniform but temporally concentrated over two to three nights. Analysis from arXiv (2023) and ScienceDirect (2021) indicates that elemental carbon and barium-rich particulates spike sharply during evening hours of the main celebration day, with levels taking 48–72 hours to return to baseline depending on wind and temperature conditions. Meteorological factors exacerbate the problem: post-monsoon inversion layers and low wind speeds trap pollutants close to the surface, particularly in northern Indian plains. Urban centres like Delhi, Kanpur, and Lucknow experience the most severe effects due to pre-existing pollution loads and vehicular emissions. In contrast, rural regions exhibit lower absolute concentrations but still face noticeable deterioration in air quality and visibility. The combination of meteorological stagnation and dense urban emissions thus transforms the festival period into one of the most polluted times of the year in India.

3.2 Legal / Rights and Regulation Findings

3.2.1 Legal Basis of the Right to a Pollution-Free Environment in India

The Constitution of India does not explicitly mention the “right to a clean environment,” but the Supreme Court has repeatedly interpreted Article 21 — *Right to Life and Personal Liberty* — to include it. Beginning with *Subhash Kumar v. State of Bihar* (1991) and later reinforced in *M.C. Mehta v. Union of India* (1987, 1992), the Court held that the right to life encompasses the right to live in a healthy environment. Complementary constitutional provisions i.e. Articles 48A (Directive Principles) and 51A(g) (Fundamental Duties), impose obligations on the State and citizens to protect and improve the environment. Through its environmental jurisprudence, the Court also embedded global environmental doctrines such as the precautionary principle, polluter pays principle, and sustainable development into Indian law, making them enforceable through judicial interpretation.

3.2.2 Regulatory Framework for Firecrackers in India

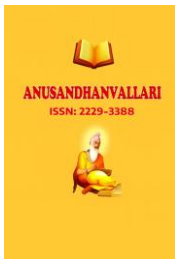
Several statutory instruments govern the control of firecracker emissions:

- The Air (Prevention and Control of Pollution) Act, 1981, regulates the discharge of pollutants into the atmosphere and empowers Pollution Control Boards to set emission standards.
- The Environment (Protection) Act, 1986, provides an overarching framework for environmental regulation and has been used to issue notifications limiting chemical compositions in fireworks.
- The Noise Pollution (Regulation and Control) Rules, 2000, prescribe permissible noise levels and timing restrictions for use of loudspeakers and firecrackers (Divan & Rosencranz, 2022).

Following rising public health concerns, the Supreme Court of India (2017) imposed a ban on the manufacture and sale of firecrackers containing barium and other toxic elements, leading to the introduction of “green crackers” under CSIR certification. However, compliance remains inconsistent across states. Several states — including Bihar, Maharashtra, West Bengal, and Delhi — have periodically imposed time-bound or blanket bans during Diwali to curb pollution (The Times of India, 2023).

3.2.3 Case Law and Enforcement Issues

Judicial decisions in India are gradually developing a balance between environmental protection and economic



rights. In *Dr. P.G. Najpandy v. Chief Secretary, Government of Tamil Nadu* (2023), the Madras High Court stated that the right to carry on business under Article 19(1)(g) is not unlimited. This right must give way to the larger public interest of protecting the environment. Similarly, in *Arjun Gopal v. Union of India* (2018), the Supreme Court clearly held that cultural traditions cannot be used as a reason to harm public health or the environment. In this case, the Court did not impose a total ban on firecrackers. However, it allowed only low-polluting green crackers to be sold, and that too only by licensed sellers. The Court also fixed specific time limits for bursting crackers. On Diwali and other religious festivals, crackers can be burst only between 8:00 PM and 10:00 PM. On Christmas and New Year's Eve, bursting is allowed only between 11:45 PM and 12:45 AM (Krishnan, 2021). Further, the Court directed that firecrackers may be used only in designated areas. Despite these rulings, enforcement gaps persist. Reports from the Central Pollution Control Board (CPCB) show recurring violations of time and noise restrictions across major cities. Weak on-ground monitoring, inadequate penalty mechanisms, and social resistance rooted in cultural justification hinder effective implementation.

3.3 Balanced Analysis: Toward Balancing Cultural Practice and Environmental/Animal Welfare Rights

3.3.1 Cultural Rights versus Environmental Rights

The freedom to practise religion and culture under Articles 25–29 of the Constitution protects the celebration of Diwali, including symbolic traditions like lighting lamps and fireworks. However, these freedoms are subject to public order, morality, and health. The Supreme Court has clarified that no fundamental right is absolute, and the State may impose reasonable restrictions to protect environmental and public health. Thus, the conflict between cultural freedom and environmental rights demands proportional balancing — permitting cultural expression within ecologically sustainable limits. The judiciary's stance reflects a shift from absolute cultural autonomy to conditional tolerance, emphasizing that preserving tradition must not compromise ecological integrity (Rocco et al., 2025).

3.3.2 Zoological and Animal Welfare Dimension in Legal Regulation

Although Indian environmental statutes address human-centric pollution harms, animal welfare remains underrepresented in festival-related regulation. The Prevention of Cruelty to Animals Act, 1960 criminalizes cruelty but does not specifically include firecracker-related harm. Neither the Noise Rules nor the Environment Act explicitly mention wildlife or domestic animal protection during festivals. In practice, animal welfare organizations such as the Animal Welfare Board of India (AWBI) issue advisories urging restraint during Diwali, but these lack statutory force. Integrating zoological parameters — such as thresholds for noise tolerance in fauna or ecological impact assessments — into regulatory frameworks remains an unfulfilled need.

3.3.3 Policy and Practical Dilemmas: Trade-Offs and Balancing Mechanisms

Policymakers face the difficult task of reconciling cultural traditions, economic livelihoods, and environmental sustainability. The firecracker industry supports thousands of workers in Tamil Nadu's Sivakasi region, providing a vital source of income for many families. At the same time, urban citizens emphasize the importance of preserving cultural continuity through festivals and celebrations that traditionally involve fireworks. However, the environmental and animal welfare costs associated with such practices — including respiratory illnesses, habitat disturbance, and even animal mortality — cannot be ignored. To strike a balance between tradition and sustainability, several mechanisms can be adopted. One approach is the promotion of verified green crackers with strict emission and decibel certification to ensure reduced pollution levels. Authorities may also designate specific “bursting zones” located away from residential and ecological areas to minimize health and environmental harm. Time restrictions can be enforced to limit nocturnal disturbances, protecting both humans and animals from excessive noise. Furthermore, public awareness campaigns should be organized to highlight the link between firecracker use, animal suffering, and declining air quality. Real-time pollution monitoring during festivals can help authorities take immediate corrective actions if pollution levels exceed safe limits. Finally, governments and



communities should work together to incentivize non-polluting alternatives such as light shows, laser displays, and communal eco-celebrations, promoting joy and festivity without compromising public health or the environment.

3.4 Recommendations

From the environmental perspective, there is a pressing need to set quantitative emission and noise thresholds for all fireworks under enforceable certification standards. Such thresholds would ensure that firecracker manufacturing and use remain within safe limits, reducing both air and noise pollution. Additionally, periodic environmental and animal impact assessments must be made mandatory for firecracker production as well as for their large-scale use during festivals. These assessments would help evaluate the ecological and zoological consequences of fireworks, ensuring that policies remain responsive to emerging environmental concerns. Furthermore, it is essential to strengthen ambient air quality monitoring networks, particularly during festive seasons, to enable real-time tracking and mitigation of pollution levels. From the legal and regulatory perspective, existing statutes should be amended to explicitly incorporate animal welfare and ecosystem protection clauses. This would close current legal gaps and make ecological preservation an integral part of regulatory enforcement. Uniform national guidelines for festival-related emissions should also be established, accompanied by state-level implementation protocols to ensure consistency and accountability across jurisdictions. In addition, citizen participation mechanisms must be introduced to allow individuals and community groups to monitor and report violations. Such participatory governance would enhance transparency and promote shared responsibility in environmental protection. Cross-disciplinary recommendations emphasize the importance of developing an integrated festival management framework that brings together environmental scientists, legal experts, community leaders, and firecracker manufacturers. Collaborative planning among these stakeholders would facilitate the co-design of sustainable celebration models, balancing cultural traditions with ecological and legal imperatives. This approach would ensure that festivals remain joyous while aligning with principles of environmental sustainability and social responsibility.

3.5 Limitations and Future Research Directions

This review acknowledges certain data limitations. Empirical zoological studies specifically examining the impacts of firecrackers remain scarce, with most findings being inferred from short-term urban pollution data rather than direct observation. To establish a clear causal relationship, there is a pressing need for longitudinal monitoring of faunal behaviour and toxic metal accumulation in affected ecosystems. Future research should therefore include year-round environmental tracking to assess the cumulative effects of pollutants on air, water, and soil quality. Behavioural studies on birds and mammals during festive noise events would provide valuable insights into species-specific stress responses and habitat disturbances. Additionally, socio-legal analyses focusing on public attitudes toward eco-friendly celebrations can help identify barriers and incentives for behavioural change. Comparative international research—such as examining the environmental management of fireworks during celebrations like the Chinese New Year or the Fourth of July—can also reveal transferable best practices relevant to the Indian context. An interdisciplinary research agenda that integrates law, environmental science, and zoology is essential for crafting effective policies. Such a holistic approach can ensure that India's cultural richness is harmonized with its constitutional commitment to ensuring a clean, healthy, and ecologically balanced environment.

4. Conclusion

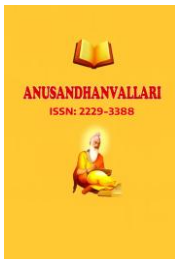
The study reveals that the use of firecrackers during Diwali has severe consequences, including air and noise pollution, physiological stress in human and animals, and long-term ecological imbalance. Despite the presence of a legal framework under the Environment (Protection) Act, 1986, and judicial interventions by the Supreme



Court, enforcement remains weak and inconsistent. The animal welfare dimension—particularly the distress caused to birds, pets, and urban wildlife—continues to receive limited attention in both policy and public discourse. While Diwali holds deep cultural and religious significance, the practice of bursting firecrackers must be reconciled with the constitutional duties to protect the environment and show compassion for living creatures. This calls for an integrated approach combining legal enforcement, public awareness, and the promotion of eco-friendly celebrations. Policymakers must urgently strengthen monitoring mechanisms, incentivize green alternatives, and incorporate animal welfare considerations into environmental regulations. Balancing cultural traditions with ecological and legal responsibilities is not merely a policy choice—it is an ethical and constitutional imperative. Immediate and collective action is essential to safeguard environmental integrity, ensure animal welfare, and uphold the spirit of sustainable celebration in India.

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