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RESEARCH ARTICLE

VEHICULAR POLLUTION IN SIKKIM: A LEGAL ANALYSIS OF REGULATORY FRAMEWORKS, JUDICIAL TRENDS, AND POLICY GAPS

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ABSTRACT

This paper presents a legal analysis of vehicular pollution in Sikkim, examining the adequacy of regulatory frameworks, judicial trends, and underlying policy gaps within the context of the Himalayan state's ecological fragility. Sikkim, despite its reputation as an environmentally conscious region, faces escalating air quality threats primarily driven by a surge in tourism-related and private vehicle use, particularly fossil-fuel-based transport. The study first evaluates the efficacy and enforcement of national laws (Motor Vehicles Act, 1988; Environment Protection Act, 1986; Air Act, 1981) and state-specific policies (EV Policy, old vehicle restrictions) in Sikkim. It highlights the unique geographic and infrastructural challenges in the hill region that complicate enforcement of Pollution under Control (PUC) norms and limit the adoption of electric vehicles (EVs). Second, the paper analyses judicial jurisprudence, drawing parallels from landmark Supreme Court judgments like *MC Mehta v. Union of India* (1998) and relevant National Green Tribunal (NGT) orders for other hill stations. It argues that while Article 21 (Right to Life) guarantees a clean environment, there is a distinct paucity of judicial pronouncements specifically tailored to the ecological vulnerabilities of Sikkim. Third, the analysis identifies crucial policy gaps, including inadequate monitoring infrastructure, weak inter-agency coordination, and an unsustainable dependence on diesel-based tourism transport. Ultimately, the paper proposes a set of context-specific reforms, advocating for stronger state-specific legislation, establishing robust real-time monitoring systems, prioritizing the electrification of public and tourism transport, and calling for judicial pro-activeness to enforce emission controls. The findings underscore the need for Sikkim to move beyond symbolic green initiatives towards a legally mandated, well-enforced, and sustainable transport policy that harmonizes economic development, constitutional mandates, and environmental preservation in the vulnerable Eastern Himalayas.

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INTRODUCTION

Background of Environmental Challenges in the Himalayan Region: The Himalayan region is one of the most ecologically sensitive zones in the world, characterized by fragile ecosystems, rich biodiversity, and unique climatic conditions (Singh and Thadani 2015). Rapid urbanization, infrastructure development, and increasing vehicular dependence in hill states have placed immense pressure on the environment, leading to air pollution, deforestation, and glacial retreat (Sharma et al. 2018). Studies have highlighted that vehicular emissions contribute significantly to deteriorating air quality in mountain towns, exacerbating respiratory and cardiovascular diseases among local populations (Pant et al. 2020).

Specific Rise of Vehicular Emissions in Sikkim despite Being an Ecologically Fragile State: Sikkim, a state globally recognized for its conservation policies, organic farming initiatives, and eco-tourism, is increasingly facing the problem of vehicular emissions (Tambe et al. 2012). The rapid growth of tourism, coupled with a rise in private vehicle ownership, has led to increased traffic congestion in towns such as Gangtok, Namchi, and Pelling (CSE 2019). Unlike industrial emissions, vehicular pollution is harder to regulate in hill regions because of steep gradients, poor road infrastructure, and the dependence of local livelihoods on diesel-based transport services (Ghosh 2020). As a result, vehicular pollution has emerged as one of the primary threats to Sikkim's fragile air quality and ecological balance (Lama and Pradhan 2021).

Significance of Studying Vehicular Pollution in the Context of Sustainable Development and Constitutional Mandates: The issue of vehicular pollution in Sikkim needs to be examined not only from an environmental science perspective but also through the lens of law and policy. Article 21 of the Indian Constitution guarantees the right to life, which the Supreme Court has interpreted to include the right to a clean and healthy environment (Subhash Kumar v. State of Bihar, 1991). In addition, Directive Principles of State Policy (Articles 47 and 48A) and Fundamental Duties (Article 51A (g)) place obligations on both the state and citizens to protect the environment (Divan and Rosencranz 2021). Given the Sustainable Development Goals (SDGs) 11 and 13, which emphasize sustainable cities and climate action,

assessing vehicular pollution in Sikkim acquires global as well as national significance (United Nations 2015).

Objectives of the Paper: This paper sets out three major objectives. First, to evaluate the adequacy and enforcement of national and state-level legal frameworks regulating vehicular pollution in Sikkim.Second, to analyse judicial interventions and relevant case law in addressing vehicular emissions and their applicability in the Sikkimese context. Third, to identify policy gaps and propose reforms that can strengthen the state's capacity to balance developmental aspirations with ecological sustainability (Mehta 2019).

Conceptual Framework of Vehicular Pollution

Definition and Types of Vehicular Emissions: Vehicular pollution refers to the release of harmful gases and particulate matter from the combustion of fossil fuels in automobiles (Faiz et al. 1996). The major pollutants include carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), volatile organic compounds (VOCs), hydrocarbons, and particulate matter (PM2.5 and PM10) (Colvile et al. 2001). Diesel engines are particularly associated with high levels of PM and NOx emissions, while petrol engines emit more CO and hydrocarbons (Sharma and Dikshit 2016). These pollutants interact with sunlight and atmospheric conditions, giving rise to secondary pollutants such as ground-level ozone and smog (WHO 2018).

Impact on Environment: Air Quality, Biodiversity, Glaciers, and Water Resources in Sikkim: Vehicular emissions significantly degrade ambient air quality in hill towns, where atmospheric dispersion is limited due to narrow valleys and inversion layers (Pant and Harrison 2012). In Sikkim, the rapid increase in vehicles has contributed to rising particulate matter concentrations, threatening the state's "clean and green" reputation (CSE 2019). Black carbon from diesel exhaust has been identified as a major contributor to glacier melt in the Eastern Himalayas, accelerating climate-induced risks in Sikkim (Ramanathan and Carmichael 2008; Xu et al. 2009). Furthermore, pollutants deposit on soil and water sources, disrupting fragile mountain ecosystems and threatening biodiversity-rich areas, including Khangchendzonga National Park (Lama and Pradhan 2021).

Impact on Human Health: Respiratory, Cardiovascular, and Neurological Disorders: Exposure to vehicular pollutants has been directly linked to a range of health problems. Fine particulate matter (PM2.5) penetrates deep into the lungs and bloodstream, leading to respiratory illnesses such as asthma, bronchitis, and chronic obstructive pulmonary disease (Pope and Dockery 2006). Long-term exposure to NOx and CO is associated with cardiovascular diseases, including hypertension and ischemic heart disease (Brook et al. 2010). Studies also indicate that vehicular emissions can affect neurological health, particularly cognitive development in children and neurodegenerative disorders in older populations (Block and Calderón-Garcidueñas 2009). In Sikkim, where road transport is the primary mode of mobility, such health risks are becoming increasingly visible in urban centres like Gangtok (Ghosh 2020).

Link to Climate Change and Regional Vulnerability of the Eastern Himalayas: Vehicular emissions are closely tied to climate change because of greenhouse gases such as CO_2 and short-lived climate pollutants like black carbon (Bond et al. 2013). The Eastern Himalayas are one of the most climate-vulnerable regions globally, experiencing rising temperatures, irregular precipitation, and accelerated glacial retreat (ICIMOD 2019). In Sikkim, black carbon deposition from vehicular exhaust is particularly concerning; as it darkens snow surfaces, reduces albedo, and speeds up ice melt (Menon et al. 2010). This not only endangers water security for millions downstream but also heightens disaster risks such as glacial lake outburst floods (GLOFs) in the state (Shrestha et al. 2012). Hence, vehicular pollution is both an immediate health challenge and a long-term climate threat to Sikkim's ecological stability.

Regulatory Frameworks Governing Vehicular Pollution in Sikkim

National Legal Framework

Motor Vehicles Act, 1988 and Amendments: The Motor Vehicles Act, 1988, along with its subsequent amendments, provides the legal foundation for regulating vehicular emissions in India. The Act empowers authorities to prescribe emission standards, mandate periodic fitness testing, and enforce Pollution under Control (PUC) certification (MoRTH 2019). Provisions under Section 110 empower the central government to set standards for vehicles, while Section 190 prescribes penalties for using polluting vehicles (Kumar 2020). These provisions are applicable in Sikkim and form the baseline regulatory framework.

Environment Protection Act, 1986: The Environment Protection Act (EPA), 1986, serves as umbrella legislation, granting wide powers to the central government to regulate environmental pollution, including vehicular emissions (Divan and Rosencranz 2021). Under Section 3 of the EPA, the government can issue notifications, set emission standards, and direct state authorities to act. Rules such as the Environment (Protection) Rules, 1986, have been used to implement vehicular emission standards and noise control norms nationwide (Sahu 2014).

Air (Prevention and Control of Pollution) Act, 1981: The Air Act, 1981, specifically targets air pollution and establishes State and Central Pollution Control Boards to monitor and regulate emissions (CPCB 2018). Section 19 allows state governments, including Sikkim, to declare air pollution control areas and restrict the use of certain vehicles. The Act also empowers boards to set standards for industries and vehicles, ensuring integration with vehicular pollution control measures (Ganguly 2017).

Bharat Stage (BS) Emission Norms: The introduction of Bharat Stage emission norms has been a crucial measure to reduce vehicular pollution in India. Starting from BS-I in 2000 to the implementation of BS-VI in 2020, these norms regulate permissible limits for pollutants such as NOx, PM, and CO (ICCT 2020). For Sikkim, adherence to BS-VI norms has meant phasing out older, highly polluting vehicles and encouraging the purchase of new compliant vehicles (MoRTH 2020).

State-Specific Framework in Sikkim

State Pollution Control Board Mandates: The Sikkim State Pollution Control Board (SPCB) plays a critical role in implementing national laws at the local level. It monitors vehicular emissions, ensures compliance with PUC certification, and issues directions under the Air Act and EPA (SPCB Sikkim 2019). Regular inspection drives in urban centers such as Gangtok are undertaken to enforce emission standards (CSE 2019).

Local Policies Promoting Electric Vehicles (EVs): Sikkim has adopted forward-looking policies to promote electric vehicles as part of its eco-friendly development model. The state offers subsidies, tax exemptions, and charging infrastructure to encourage EV adoption (DoT Sikkim 2020). It was one of the first states in the North-East to formulate an EV policy aligned with the national FAME scheme (Mishra 2021).

Restrictions on Old Vehicles and Eco-Tourism Transport Policies: In an attempt to control vehicular emissions, the state has imposed restrictions on old, diesel-based vehicles, particularly in urban and eco-tourism zones (Pradhan 2021). For instance, tourist vehicles operating in sensitive areas such as Tsomgo Lake and Nathu La are required to follow stricter emission checks (Lama 2020). Such policies balance tourism-based revenue generation with ecological preservation.

Coordination between State Transport Authority and Pollution Control Board: Effective regulation of vehicular pollution requires close coordination between the State Transport Authority (STA) and the SPCB. While the STA handles vehicle registration, road permits, and enforcement of the Motor Vehicles Act, the SPCB monitors emissions and issues directives under the Air Act (SPCB Sikkim 2019). Joint enforcement campaigns, such as roadside checks for PUC compliance, reflect this institutional synergy (Ghosh 2020).

Judicial Trends and Case Law

Role of Indian Judiciary in Environmental Protection (Public Interest Litigations): The Indian judiciary has played a pioneering role in environmental protection through the expansion of Public Interest Litigations (PILs). Since the 1980s, the courts have adopted an activist stance, entertaining petitions from individuals and NGOs on issues ranging from industrial pollution to vehicular emissions (Sathe 2002). The judiciary has not only enforced statutory provisions but also read constitutional guarantees expansively to include environmental rights (Upadhyay 2010). This trend has been instrumental in holding both the state and private actors accountable for vehicular pollution.

Landmark Supreme Court Judgments (MC Mehta v. Union of India – Vehicular Pollution in Delhi): The case of *MC Mehta v. Union of India* (1998) remains a cornerstone in India's vehicular pollution jurisprudence. The Supreme Court directed the phasing out of leaded petrol, mandated the adoption of compressed natural gas (CNG) in Delhi's public transport, and ordered stricter PUC enforcement (Divan and Rosencranz 2021). The judgment underscored the judiciary's proactive stance in addressing vehicular emissions as part of the right to life under Article 21 (Kohli and Menon 2005). These principles, though applied in Delhi, provide a model framework that could be extended to ecologically fragile states like Sikkim.

Relevance of National Green Tribunal (NGT) Orders for Hilly and Eco-Sensitive Areas: The National Green Tribunal (NGT), established under the NGT Act of 2010, has passed several significant orders regarding vehicular pollution in ecologically sensitive zones. For example, in *VardhamanKaushik v. Union of India* (2016), the NGT restricted diesel vehicles older than ten years from operating in Delhi and NCR (NGT 2016). Similarly, in cases concerning hill stations such as Shimla and Manali, the NGT emphasized limits on vehicular traffic to preserve fragile ecosystems (Choudhury 2017). These rulings are directly relevant to Sikkim, where eco-tourism is central to the economy but poses a serious vehicular pollution risk.

Case Law Specific to North-Eastern States or Eco-Sensitive Regions and Implications for Sikkim: Although case law directly concerning Sikkim is limited, judicial interventions in other North-Eastern states and eco-sensitive regions are instructive. For instance, the NGT's order in *ParyavaranSurakshaSamiti v. Union of India* (2017) emphasized stricter enforcement of emission standards in sensitive zones (Sharma 2018). Likewise, in Arunachal Pradesh and Himachal Pradesh, the courts have dealt with issues of road expansion, vehicular load, and its ecological consequences (Bhattacharya 2019). These precedents underline the judiciary's recognition of hill ecosystems' unique vulnerability, which has direct implications for Sikkim's transport and tourism sectors.

Judicial Interpretation of Article 21 (Right to Life) and Its Extension to the Right to a Pollution-Free Environment: Article 21 of the Constitution has been expansively interpreted to include the right to a clean and healthy environment. In *Subhash Kumar v. State of Bihar* (1991), the Supreme Court held that the right to life includes the right to enjoyment of pollution-free water and air (Agarwal 2005). Similarly, in *CharanLalSahu v. Union of India* (1990), the Court reiterated that environmental protection is intrinsic to the right to life (Singh 2013). This judicial trend strengthens the argument that vehicular pollution, which directly impacts air quality and health, is a violation of fundamental rights. For Sikkim, Article 21 provides the constitutional basis for stricter legal and judicial interventions to safeguard both human health and fragile ecosystems.

Policy Analysis and Implementation Challenges
Policy Initiatives

National Electric Mobility Mission Plan and FAME: The Government of India launched the National Electric Mobility Mission Plan (NEMMP) in 2013 and subsequently the FAME scheme to promote adoption of hybrid and electric vehicles (Dhar et al. 2017). The policies focus on reducing vehicular emissions by incentivizing EV manufacturing, consumer adoption, and charging infrastructure development (NITI Aayog 2019). These initiatives are crucial for hill states like Sikkim, where fossil-fuel transport contributes disproportionately to air pollution in ecologically fragile zones (Mishra 2021).

Sikkim's EV Adoption and Incentives for Green Mobility: Sikkim was among the first North-Eastern states to announce an Electric Vehicle Policy (2020) aligned with FAME II (DoT Sikkim 2020). The policy provides tax exemptions, registration fee waivers, and direct subsidies for EV buyers (Pradhan 2021). Additionally, the state has prioritized setting up charging stations in Gangtok and tourist corridors, promoting a gradual shift from diesel taxis to e-vehicles (Lama and Pradhan 2021). This aligns with Sikkim's long-standing commitment to sustainability, exemplified earlier by its status as the first fully organic state in India (CSE 2019).

Public Transport Modernization in the State: Efforts are underway to upgrade the public transport system in Sikkim through the introduction of battery-operated buses and shared mobility services (Ghosh 2020). The Transport Department has partnered with private players to introduce electric taxis on pilot routes connecting Gangtok to nearby destinations (DoT Sikkim 2021). Such modernization is intended to reduce dependence on private vehicle ownership, which is a major source of traffic congestion and air pollution in urban areas of the state (Pant et al. 2020).

Challenges in Implementation

Inadequate Monitoring Infrastructure: One of the biggest hurdles in implementing vehicular pollution control in Sikkim is the lack of adequate monitoring systems. Air quality monitoring stations are limited, making it difficult to measure pollutant levels accurately in different towns and eco-sensitive zones (CPCB 2018). Similarly, vehicular testing facilities are underdeveloped, leading to weak enforcement of emission standards (Ganguly 2017).

Lack of Awareness and Enforcement of PUC Norms: Despite the mandatory requirement for PUC certificates under the Motor Vehicles Act, compliance rates in Sikkim remain low (MoRTH 2019). Public awareness campaigns about vehicular pollution are infrequent, and enforcement by authorities is sporadic (Sharma 2020). This weakens the deterrent effect of penalties under national laws.

Geographic and Infrastructural Constraints in Hill Regions: The hilly terrain of Sikkim creates unique challenges for implementing sustainable transport systems. Narrow roads, steep gradients, and limited parking infrastructure make it difficult to introduce large-scale public transport or electric bus systems (Tambe et al. 2012). Additionally, charging infrastructure for EVs faces obstacles due to limited land availability and inconsistent electricity supply in remote areas (ICIMOD 2019).

Dependence on Fossil-Fuel-Based Tourism Transport: Tourism is the backbone of Sikkim's economy, but the sector's dependence on diesel taxis, jeeps, and buses significantly contributes to vehicular pollution (Lama 2020). Tourist destinations such as Tsomgo Lake, Nathula, and North Sikkim circuits witness seasonal traffic congestion, resulting in localized spikes in vehicular emissions (CSE 2019). While eco-tourism policies exist, enforcement and adoption of

greener alternatives such as shared EVs remain limited (Pradhan 2021).

Comparative Analysis

Best Practices from Other Indian States: Several Indian states have pioneered measures to curb vehicular pollution that may serve as models for Sikkim. Delhi's *odd-even vehicle rationing scheme* introduced in 2016 helped reduce vehicular congestion and temporarily improved air quality (Goel et al. 2016). Similarly, the Supreme Court-mandated shift of Delhi's public transport fleet to *compressed natural gas (CNG)* significantly lowered emissions of SO_2, CO, and PM (Narain and Krupnick 2007). States like Maharashtra and Karnataka have also implemented EV subsidy programs and expanded charging infrastructure under FAME-II, boosting early adoption (NITI Aayog 2019). These experiences demonstrate how a mix of judicial intervention, technological innovation, and financial incentives can effectively reduce vehicular emissions.

International Approaches to Vehicular Pollution Control: Globally, many countries have successfully implemented stringent vehicular emission controls. *Bhutan*, as a neighboring Himalayan state, has focused on promoting eco-transport through bans on older vehicles, tax exemptions for EVs, and development of pedestrian-friendly infrastructure (Dorji 2018). *Norway* is considered a global leader in EV adoption, with over 60% of new car sales in 2020 being electric, enabled by aggressive subsidies, toll exemptions, and widespread charging facilities (Figenbaum 2017). *Singapore* has also effectively curbed private car ownership through its Certificate of Entitlement (COE) system, thereby reducing traffic and emissions (Phang 2018). These international models emphasize strong regulatory frameworks, economic incentives, and infrastructure investment.

Lessons Sikkim Can Adopt Considering Its Ecological and Socio-Economic Context: For Sikkim, lessons from both national and international practices suggest the importance of context-specific adaptation. From Delhi, Sikkim can learn the benefits of judicially backed measures such as stricter enforcement of PUC norms and phasing out old diesel vehicles (Divan and Rosencranz 2021). From Bhutan, Sikkim can adopt eco-tourism-friendly transport models that align with its organic and sustainable development policies (Dorji 2018). Norway's model, while resource-intensive, illustrates the long-term feasibility of large-scale EV integration that Sikkim could adopt gradually through targeted incentives and rural charging stations (Figenbaum 2017). However, unlike metropolitan regions, Sikkim's hilly terrain and dependence on tourism-based transport require hybrid solutions—such as introducing shared EV fleets for tourists, localized odd-even schemes in congested towns, and subsidies tailored to small taxi operators (Pradhan 2021). Thus, a comparative approach suggests that Sikkim must balance strict regulation with economic inclusivity to ensure both environmental protection and livelihood security.

Gaps in Legal and Policy Framework

Overlapping Jurisdictions between Central and State Authorities: One of the persistent challenges in vehicular pollution governance is the overlapping jurisdiction of central and state authorities. While the Central Pollution Control Board (CPCB) sets national emission standards, the State Pollution Control Boards (SPCBs) are responsible for enforcement, often leading to coordination gaps (Ganguly 2017). In Sikkim, this overlap manifests in weak synchronization between the Ministry of Road Transport and Highways (MoRTH), CPCB, and local authorities, resulting in delayed implementation of emission norms (Sharma 2020).

Weak Enforcement of Existing Laws: Although statutory provisions under the Motor Vehicles Act, Environment Protection Act, and Air Act provide a robust legal framework, enforcement remains weak. Regular Pollution under Control (PUC) checks are often irregular, and penalties for non-compliance are rarely imposed (MoRTH 2019). In Sikkim, limited manpower and inadequate monitoring facilities restrict the state's ability to enforce emission standards effectively (CSE 2019). This lack of stringent enforcement dilutes the deterrent effect of existing laws (Kumar 2020).

Insufficient Judicial Pronouncements Specifically Targeting Vehicular Emissions in Sikkim: While the judiciary has been proactive in dealing with vehicular pollution in metropolitan areas like Delhi (MC Mehta v. Union of India, 1998), there is a paucity of case law directly addressing vehicular emissions in Sikkim (Bhattacharya 2019). The absence of judicial interventions tailored to the unique ecological vulnerabilities of the Himalayan states means that Sikkim lacks binding judicial precedents to guide regulatory action (Choudhury 2017). This judicial silence perpetuates policy inertia in the region.

Policy Lag in Incentivizing Sustainable Transport Infrastructure: Despite national-level initiatives such as the FAME scheme, Sikkim's transition toward sustainable mobility has been slow. Charging infrastructure for EVs remains limited to a few urban centres, restricting large-scale adoption (DoT Sikkim 2020). Moreover, subsidies and incentives for green transport are insufficient compared to states like Delhi or Karnataka (NITI Aayog 2019). This policy lag not only hampers the growth of eco-friendly mobility but also sustains dependence on fossil-fuel-based tourism transport (Pradhan 2021). Without proactive investment in infrastructure, Sikkim risks falling behind in meeting both national and international climate targets (ICIMOD 2019).

Suggestions and Recommendations

Strengthening State-Specific Legislation Tailored to Sikkim's Ecological Vulnerability: Sikkim requires state-specific laws and regulatory frameworks that acknowledge its unique Himalayan ecology. While central legislations like the Motor Vehicles Act and Air Act provide a baseline, a dedicated state law focusing on transport sustainability and emission control could enhance effectiveness (Sharma 2020). Similar to how Delhi's environmental regulations evolved under judicial oversight, Sikkim can enact stricter controls on old vehicles and introduce area-specific emission caps in eco-sensitive zones (Divan and Rosencranz 2021).

Establishing Robust Vehicular Emission Testing and Monitoring Systems: The current monitoring infrastructure in Sikkim is inadequate, with limited PUC facilities and air quality monitoring stations (CPCB 2018). Establishing decentralized emission testing centres across districts would improve compliance and accountability (Ganguly 2017). Additionally, integrating real-time monitoring technologies, such as remote sensing devices for vehicular emissions, can help overcome manpower shortages in enforcement (Pant and Harrison 2012).

Incentivizing Public Transport Electrification and Reducing Reliance on Diesel Taxis: Given the dominance of diesel-powered taxis in Sikkim's tourism economy, the state should prioritize electrification of public transport fleets. Incentives such as higher subsidies for electric taxis, soft loans for vehicle replacement, and tax exemptions could encourage adoption (Mishra 2021). Pilot projects introducing shared electric vehicles in popular tourist circuits—similar to Bhutan's eco-transport model—would reduce both congestion and emissions (Dorji 2018).

Judicial Pro-activeness in Extending Delhi-Model Jurisprudence to North-Eastern States: The judiciary's interventions in Delhi through *MC Mehta v. Union of India* (1998) set a strong precedent for addressing vehicular pollution. However, similar judicial scrutiny has not been extended to ecologically fragile states like Sikkim (Bhattacharya 2019). Proactive judicial intervention, either by the Supreme Court or the NGT, can enforce stricter timelines for phasing out old vehicles and mandate EV adoption in eco-sensitive hill towns

(Choudhury2017). Such jurisprudence would integrate environmental rights under Article 21 with region-specific ecological vulnerabilities.

Integrating Vehicular Emission Control with Sustainable Tourism Policy: Tourism contributes significantly to vehicular pollution in Sikkim, with diesel taxis forming the backbone of tourist mobility (Pradhan 2021). Integrating emission control into tourism policies by promoting eco-tourism transport packages, restricting high-emission vehicles in protected areas, and introducing carbon offset mechanisms could balance economic growth with environmental protection (Lama and Pradhan 2021). Lessons from Bhutan and Nepal demonstrate that tourism-driven economies can thrive while embracing sustainable transport systems (Dorji 2018; ICIMOD 2019).

CONCLUSION

Summary of Findings on Vehicular Pollution Challenges in Sikkim

Vehicular pollution has emerged as one of the most pressing environmental concerns in Sikkim, driven largely by increased private vehicle ownership, diesel-based tourism transport, and limited adoption of clean technologies (CSE 2019). The ecological fragility of the Himalayan region exacerbates the impact of vehicular emissions on air quality, biodiversity, glaciers, and human health (Pant et al. 2020). Despite Sikkim's reputation as an environmentally conscious state, the unchecked rise of vehicular pollution poses a significant threat to its ecological balance (Lama and Pradhan 2021).

Reflection on the Adequacy of Existing Legal Frameworks and Judicial Interventions: While national legislations such as the Motor Vehicles Act, Air Act, and Environment Protection Act provide a comprehensive framework, their enforcement in Sikkim remains weak (Ganguly 2017). Judicial interventions, particularly the Supreme Court's activism in *MC Mehta v. Union of India* (1998), have been instrumental in curbing vehicular pollution in Delhi, but similar jurisprudence has not been adequately extended to eco-sensitive states like Sikkim (Divan and Rosencranz 2021). The lack of specific judicial pronouncements targeting vehicular pollution in the North-East reflects a gap in region-sensitive environmental adjudication (Bhattacharya 2019).

Call for Stronger Policy Integration, Community Participation, and Legal Enforcement: Sikkim requires a holistic approach combining legal reforms, policy innovation, and grassroots participation. Strengthening monitoring infrastructure, incentivizing EV adoption, and integrating sustainable transport within tourism policies can help reduce dependence on fossil fuels (Mishra 2021). Community participation—through awareness campaigns, citizen reporting of non-compliant vehicles, and stakeholder consultations—must complement formal legal enforcement (Sharma 2020).

Concluding Remarks on Balancing Developmental Needs and Environmental Sustainability in the Himalayan State: The challenge for Sikkim lies in reconciling its economic dependence on tourism and transport with its constitutional and ecological obligations. Balancing development with environmental sustainability requires region-specific strategies, judicial vigilance, and proactive governance (ICIMOD 2019). By aligning local policies with global climate goals and constitutional mandates under Article 21, Sikkim has the opportunity to emerge as a model Himalayan state that harmonizes mobility, ecology, and human well-being (United Nations 2015).

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