



Policy Brief

RETHINKING SMOG MITIGATION IN PUNJAB: POLICY EFFECTIVENESS, GOVERNANCE GAPS, AND INCENTIVE-BASED SOLUTIONS

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INTRODUCTION

South Asia, home to nearly one-quarter of the world's population, consistently ranks among the most polluted regions globally. During the winter month each year, vehicular emissions, industrial activities, crop residue burning and internal land-use modification contributes to dense smog episodes that cause millions of premature deaths annually and impose substantial economic costs across major cities like Delhi, Lahore, and Karachi.

Despite national efforts and growing recognition of the need for regional cooperation advocated by the World Bank, current policies and initiatives remain insufficient. This policy incompetency underscore the urgent imperative for cross-border collaboration to achieve cost-effective reductions in smog and to create smog free environment.

By linking effectiveness of government policies and initiative with smog, the current research provides evidence-based and scientifically proven guidance for making policy implementation strategic and successful. The study directly supports SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action) and SDG 16 (Peace, Justice and Strong Institutions) by addressing smog issues monitoring, control and compliance.

Furthermore, these efforts align closely with its Nationally Determined Contributions (NDCs) under the Paris Agreement. Pakistan's updated NDC (submitted in 2021) explicitly recognizes air pollution and mitigation of short-lived climate pollutants (SLCPs). The NDC outlines high-priority mitigation options that deliver substantial co-benefits for air quality, including upgrading brick kilns to zigzag technology (which significantly reduces emissions in Punjab), transitioning to Euro-5 emission standards for vehicles, controlling methane from rice production, and promoting better manure management in livestock. Similar research studies support Pakistan's ambitious target of reducing projected greenhouse gas emissions by up to 50% by 2030.



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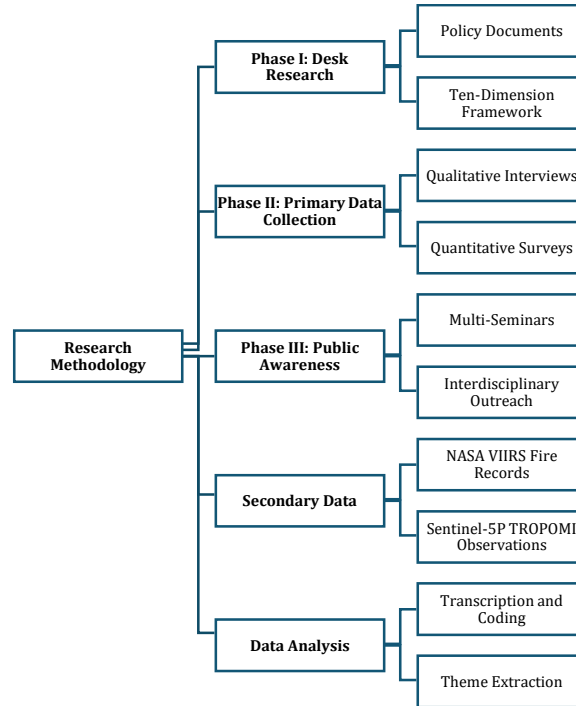
The following objectives have been setup for the current project:

1. Identifying the Smog mitigation, adaptation and resilience focused policies and initiatives undertaken by Government, Large Autonomous Organizations and Non-Governmental Sectors from 2016 onwards.
2. Policy evaluation of the existing policies and initiatives to determine success, challenges, limitations and future trajectories.
3. Assessment of the readiness to adopt and estimating the adoption impact on city’s smog on carbon emissions
4. To create a public/social awareness of the severity of issue and its solution.

METHODOLOGY

This study employed a mixed-methods approach to assess smog-related environmental policies in Punjab, Pakistan, and evaluate the feasibility of carbon credit mechanisms. The research was structured in three phases.

Figure 3: The Flowchart of the Research Process



Source: Authors' compilations.



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FINDINGS AND CONCLUSIONS

The evaluation of smog mitigation policies and initiative of Government of Punjab Pakistan reveals minor gaps in implementation despite several policy and initiative frameworks. Desk reviews of provincial policies, such as the Punjab Clean Air Policy and Smog Control Strategy 2024–2025, highlight dominant themes including environmental protection, public health, and climate adaptation, with a geographic focus on urban centers like Lahore. This underscores inclusive and cross-border collaboration deficits.

Most of the policies based on command and control manner, and few are climate finance or economic-based. While, soft behavior program remained inactive before December 2024. KPIs of policies have also been set recently after 2023 prior to this no KPIs were set and targets were missing. Keeping all target sectors being the major culprits, Transport sector found most matured in terms of policy implementation keeping Punjab air clean policy 2019 as base reference document. For example induction of electric vehicles was a significant step of government. It is scientifically proved that there are moderate SO₂ and NO₂ reductions along routes, but CO levels persist due to mixed fleets and background emissions with the help of Pre- and post-EV bus deployment analysis (2018 vs. 2025). However, Electric automotives and energy department coordination for making this mean sustainable found missing. Furthermore, fuel quality assurance remained the biggest challenge and reported missing by stakeholders. In transport sector, carbon credit based program such as provision of monetary or non monetary benefits have potential for emission reduction through behavioral shifts where travellers can be convinced to use public transport. Survey respondents of current study reveal 55% willingness to adopt cleaner modes, projecting up to 38% emission cuts if affordable, and convenient alternatives are provided. Therefore, policy makers must keep practical factors like time and cost in mind that outweigh environmental concerns in travel mode choices.

While numerous agricultural initiatives have been reported in official documents to combat smog by addressing stubble burning. But such initiatives were usually taken for large scale farmers and small scale farmers remained ignored. For instance, farmers exhibit high awareness of smog's health impacts. One farmer reported it as atmospheric cancer but continue stubble burning due to cost barriers and inaccessible alternatives like Happy Seeders. Besides, remote sensed data from NASA shows persistent burning in October-November after wheat harvesting period, with minimal reduction in active fire areas despite initiatives like the CM Smog Control Program. Wind pattern analysis (2015–2024) indicates slight transboundary influence from India in late December via easterly winds as mentioned in report in section 4.2.3, but local urban land-use changes and emissions drive 83% of local smog as reported by Urban Unit. Thus, it is challenging narratives blaming external factors like Diwali and stubble burning in neighbouring country. Furthermore, implementation of kissan card seems challenging to ensure that loan have been utilized for the



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agricultural needs only rather any domestic/other non-agricultural purpose. This monitoring mechanism is not clearly defined for kissan card implementation.

In context of industry as another major contributor, reduced emissions by adoption of technologies e.g., zigzag kilns. Furthermore, seasonal closures/green lock-downs also help to tackle the smog situation. It is noteworthy to mention that brick kilns only contribute 15% of emissions. Thus, enforcement remains limited beyond kilns, neglecting broader high-emission industries.

For the Carbon Credit-based Reservation System (CRS), feasibility is moderate: 39% participation in the Green Credit Program, with higher rates among women and middle-class respondents. Barriers include low awareness (24% "don't know"), economic disincentives, and complexity. Knowledge accuracy is strong on preventive measures like tree planting (78%) but weak on temporary fixes. For example, citizens are well-informed about building a greener future but less equipped to handle the present smog crisis safely.

In conclusion, it is observed that despite the wide range of policies and programs, their overall impact is limited by weak enforcement mechanisms, weak interdepartmental coordination, and absence of incentive programs based on smallholder farmers and low-income beneficiaries. Empirical research indicates that the smog in Lahore can be mostly attributed to proximal factors related to accelerated urbanization, vehicular emissions, industrial development, and energy use; transboundary pollution plays a secondary, although compounding role. Under these circumstances, the Green Credit Program proves the breath of fresh air, as it would help decrease emissions upto 38%, provided that there are credible alternatives which would be cheaper, more reliable and convenient to use, and offered to citizens. Enhancing institutional coordination, matching normative enforcement with incentive-based mechanisms, and putting citizen-centered solutions in the first place are likely to significantly increase policy effectiveness. Thus, these actions provide Pakistan with a viable chance of leaving the reactive smog control to the long-lasting enhancement in the air quality, thus alleviating the long-term health and economic costs in Lahore and similar urban areas with similar geographic and environmental factors.

POLICY IMPLICATIONS

The findings underscore the need for a balanced policy approach such as:

- Integrating regulatory, economic, and assuasive measures i.e. green credit program of government of Punjab. However, moderate participation in Green Credit Program implies policies must embed gender-sensitive and class-inclusive designs, with targeted outreach for lower-income groups to boost engagement from 39% to over 50%.



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- Interdepartmental coordination between Energy and Transport Department is critical to strengthen EV initiatives' effectiveness, as weak liaison will create long term deficit in energy sector.
- Economic constraints in Pakistan necessitate non-monetary incentives, such as service vouchers for Kisan Cards to prevent diversion, ensuring fiscal sustainability.
- Industrial sector needs strict compliance.
- Overall, policies should shift toward long-term behavioral change via continuous awareness campaigns in educational institution especially university, incorporating social media. This could yield 38% transport emission cuts, improving public health and aligning with SDGs and NDCs goals set by Pakistan.

RECOMMENDATIONS

As project spans the evaluation of policy, it encompasses the following recommendations:

1. Initiate cross-border air quality dialogues while strengthening domestic governance through integrated data systems in South Asia, including geo-tagging of stubble burning and industrial emissions via a unified Environmental Information Management System.
2. Reduce agricultural and transport emissions by deploying rapid-response monitoring in stubble-burning presistant hotspots including Jhang, Hafizabad, Nankana Sahib , digitizing incentive systems such as the Kisan Card, and shift toward EV-based urban mobility.
3. Support behavioral and financial transition mechanisms by introducing CRS-linked banking incentives, alongside community-based behavior change programs in schools, workplaces, and local communities to reinforce long-term pollution reduction.

The following table showing detailed plan of policy recommendation:

Table 2: Detailed Plan of Policy Recommendation

Sector	Short Term (0-6 Months)	Medium Term (1-2 Years)	Long Term (5+ Years)
Policy & Governance	<ul style="list-style-type: none"> • Begin cross-border dialogue proposals with neighboring countries in South Asian region at provincial/federal levels, that can later help to formalize Indo-Pak regional air quality agreements. 		
Agriculture (Stubble Burning & Clean Tech)	<ul style="list-style-type: none"> • Deploy rapid-response monitoring teams in October–November in presistant hotspot districts (Jhang, Hafizabad, Nankana Sahib). 	<ul style="list-style-type: none"> • Digitize Kisan Card monitoring to prevent fund diversion and introduce performance-linked recognition for districts showing >40% reduction in 	



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		fire counts.	
Transport Sector (Emissions, Fuel Quality, Fitness Testing)			<ul style="list-style-type: none"> • Full transition to EV-dominant urban mobility aligned with Pakistan’s 2030 EV target (30% of new vehicles). • Mandate annual emission inspections tied to registration renewal by 2035.
Credit Reservation System (CRS) Feasibility		<ul style="list-style-type: none"> • Partner with banks for CRS-linked incentives such as lower loan interest rates or higher credit limits. 	Province-wide CRS expansion by 2032.
Public Behavior & Social Norms		<ul style="list-style-type: none"> • Implement community-based behavioral change interventions (learning modules, school programs, corporate commuting programs). 	
Data & Monitoring Systems	<ul style="list-style-type: none"> • Begin geo-tagging stubble-burning incidents and Industrial emission sites 	Introduce an integrated Environmental Information Management System (EIMS) linking agriculture, transport, and EPA datasets	

Source: Authors’ compilations.