



RESEARCH PAPER**Role of Environmental Education in Adopting Pre-Emptive Measures of Smog in Urban Areas of South Punjab, Pakistan: A Policy Review**

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ABSTRACT

This article investigates smog prevention and mitigation policy strategies as well as the role of environmental education to adopt preemptive measures in Pakistan. Inhabitants of South Punjab (Pakistan) suffer from severe air pollution as a result of urbanization, industrialization, and agricultural practices. Existing literature on the effects of smog in metropolitan settings, as well as measures undertaken elsewhere, were evaluated. Specific challenges such as crop residue burning, automobile, industrial pollutants and interior air quality impacting smog levels were emphasized in case studies. Current environmental education programs in the region, as well as factors impacting learning, were also evaluated. The research concluded that environmental education, source reduction through rules, incentives, and community engagement are all necessary to combat pollution. Opportunities to enhance policies aimed at industries such as brick kilns and boost public acceptability of efforts remain. Environmental stewardship may be boosted through improved educational infrastructure and creative teaching practices.

KEYWORDS Air Pollution, Environmental Education, Pakistan, Policy Initiatives, Smog, South Punjab

Introduction

The smog is a significant test in the metropolitan focal point of southern Punjab, especially in Multan and Bahawalpur (Pakistan). Metropolitan development and fast modern development have intensified air contamination and the commonness of contamination. Smog (brown haze) is a perilous type of air contamination caused due to an intricate combination of risky components like insecticides sprayers, nitrogen oxides, and unpredictable biochemical mixtures. It is portrayed by a thick mist and stances serious dangers to the populace. Urbanization in Southern Punjab communities, for example, Multan, Bahawalpur, Rahim Yar Khan and Dera Ghazi Khan Districts have brought about more significant levels of contamination. Their rise in atmosphere is because of sources like vehicle discharges, modern exercises, and strong waste copying. These exercises discharge poisons into the air along with specific atmospheric conditions, they can cause brown haze. This exhaust cloud gives birth to various medical conditions, including respiratory illnesses, coronary illness, and eye aggravation (Riaz and Hamid, 2018). To really manage contamination and brown haze issues in the common capital cities of South Punjab, Pakistan, a diverse methodology is required. This study incorporates the reception and execution of guidelines pointed toward decreasing emanations from modern and car sources, the advancement of the reception of clean energy arrangements, further developed squander the

executive methods and attention to wellbeing gambles related with contamination (Rana and Bhatti, 2018).

State-run administrations assume a fundamental part in resolving the issue of smog by offering help and assets to execute measures aimed at lessening contamination and further developing air quality. Public help might incorporate early admonitions, post-debacle alleviation administrations, specialized and monetary help, and environmental awareness guidelines to empower the utilization of harmless ecosystem innovations. Moreover, advancing local area investment and developing social unions is a significant part of spurring preventive measures to battle smoke contamination (Liang et al., 2017). Generally speaking, exhaust cloud represents a significant test in the metropolitan areas of southern Punjab, Pakistan, particularly in urban communities like Multan, RYK and Bahawalpur, where air contamination is a difficult issue. The rise of brown haze can be ascribed to urbanization and modern development in unambiguous areas, which endanger the prosperity of the populace. To tackle this issue, a thorough educative methodology should be taken, including government support, local area cooperation, and severe requirements of regulation to lessen contamination and further develop air quality.

Significance of the pre-emptive measures

The smog seemed to imply significant impacts on health of people (Coronary and respiratory) residing in southern Punjab, Pakistan, and requires conclusive measures to moderate its destructive impacts. The proven and factual issue of air contamination and its hurtful consequences for well-being of humanity stresses the pressing need to address smog and its effect on better life (Solomon, 2011). Hence, it is fundamental to kill wellsprings of air contamination and produce educational awareness among people living in these areas.

A conspicuous wellspring of mist in southern Punjab is the consumption of farming buildups. The burning of horticultural waste produces vapor sprayers into the climate and influences air quality. This technique is boundless in the aforementioned district and results in smoke emanation (Singh and Kaskaoutis, 2014). Thus, endeavors ought to be made to restrict the consumption of horticultural waste and to elevate elective ways to deal with the administration of rural waste. As well as consuming harvests, modern discharges and vehicle outflows are significant reasons for Punjab's air contamination. A survey of natural contamination and strategies in Punjab stresses the requirement for a far-reaching mindfulness drive and successful execution of strategies to relieve the unsafe impacts of contamination (Kaur and Singh, 2022). This incorporates decreasing discharges from organizations and transports and empowering harmless to the ecosystem rehearses. The centralization of particles in the air is rising, causing extensive worry all through Pakistan, especially in southern Punjab. Particulate matter is the principal part of exhaust cloud and has unfavorable wellbeing impacts (Anjum et al., 2021).

Literature Review

The mix of smoke and haze creates huge difficulties in metropolitan regions, especially in the southern territory of Punjab (Pakistan), which is described by serious types of air contamination. Previous researches identified significant data about the effects of contamination on the climate and human well-being. Researcher like Zhao et al. (2013) investigated that during the colder time of the year shadiness in the northern China Fields revealed insight into the connection between smoky climate and extreme air contamination in urban areas. This finding is applicable to grasp causes of the spread of contamination in southern Punjab and its potential outcomes. Another researcher Rafique et al. (2022)

concluded that environmental education to the individuals could be helpful in controlling contamination, health, and air quality index in southern Punjab (Pakistan). The research reported effects of air contamination on the wellbeing of the residents and featured the need to go to lengths to decrease the destructive impacts of contamination on the prosperity of the metropolitan occupants of southern Punjab. Li et al. (2018) shared the similar impacts of Smog on human health as faced presently in the districts of southern Punjab (Pakistan). Furthermore, Gupta et al. (2018) investigated the connection between air contamination and respiratory misery in sound youthful grown-ups in southwestern Punjab, India. Their exploration shows that air contamination adversely affects lung capability in this populace. The review was directed at India, however because of its closeness to the nation and comparable environment conditions, its outcomes were applicable to the southern province of Punjab, Pakistan. In another review, Ju et al. (2020) examined the effect of wind-driven mist on Beijing's air contamination, stressing the significance of additional investigation into spring wind and its impact on air quality. In spite of the review's emphasis on Beijing, the discoveries give important knowledge into the expected job of feign wind in the arrangement and tirelessness of smog in metropolitan regions like southern Punjab. By and large, the exploration introduced offers helpful knowledge into the effects of metropolitan contamination, especially in the South Punjab of Pakistan.

It is obvious from the above research findings that extreme air contamination, unfavorable consequences for wellbeing and prosperity, and monetary misfortunes are closely related to one another. These outcomes stress the significance of contamination alleviation measures and the requirement for additional examination to all the more likely grasp the systems that produce smog and its remarkable results in different locales.

The current state of environmental education in the South Punjab

Above discussion clearly indicated the prevailing situation of air quality indexes in Asia generally and specifically in the southern Punjab districts. South Punjab districts are determined to be more deficient in basic health awareness, environmental education, access to clean drinking water, and sanitation than Central and North Punjab districts (Hameed & Qaiser, 2019). This shows that the lack of basic awareness about pollution, health hazards due to air index, and infrastructure in the area can affect environmental education. These districts, on the other hand, confront hurdles in terms of social development and basic services. The presence of Siraiki nationalist ethnicity, which permeates movements for eco-equity in Southern Punjab, is one of the elements (Ahmad, 2022). This suggests that the region has a mobilization and resistance movement calling for environmental justice. In addition, there are factors that cause educational exclusion of children in southern Punjab, which may affect environmental education. A study in southern Punjab found that parental attitudes towards children's education and teacher-related characteristics play a role in educational exclusion (Zulfiqar et al., 2020). This means that the exclusion of children from education, especially environmental education, can negatively affect the overall level of environmental education in the region. Socio-cultural and economic barriers hinder the provision of educational rights, especially for women in southern Punjab (Sattar et al., 2012). This suggests that there may be gender differences in access to education, especially environmental education, which may affect the current status of environmental education in the region.

Resultantly, the education regarding environmental in South Punjab, Pakistan is affected by issues such as environmental justice mobilization, barriers to social development and basic services, causes of educational exclusion, and socio-cultural and economic constraints. These issues underscore the need for the region to address

socioeconomic and educational inequities, improve basic services, and promote environmental awareness and education.

Policy initiatives related to smog and environmental education.

Smog policy measures and environmental education have been a source of concern and inquiry in Asia. (Kaur & Singh, 2022) undertook an assessment of environmental pollution and policy activities in Punjab (India) which gives insights on policy measures implemented in the neighboring region. This also affects air index quality in Pakistani Punjab too as they shared borders. In terms of air pollution, (Pervaiz et al., 2020) did a preliminary study of air quality index during the COVID-19 lockdown in Punjab, Pakistan, highlighting the unforeseen benefit to the environment. This shows that governmental interventions like as lockdowns can help to reduce pollution and improve air quality. Another element that leads to pollution and environmental problems is urbanization. Rana and Bhatti (2018) address the problems and potential of urbanization in Punjab (Pakistan). The research emphasizes the need of provincial and national urban development policy in addressing the problems of increasing urbanization.

Anjum et al. (2021) conduct a critical evaluation of Pakistan's emerging problem of air pollution and growing particle matter. This assessment provides light on the gravity of the problem and the need of governmental measures to reduce smog and enhance air quality. Furthermore, Asghar et al. (2022) give monthly air quality index (AQI) statistics on air pollution, including particles like PM_{2.5}, PM₁₀, NO₂, SO₂, and O₃. This demonstrates that the need of monitoring air quality and increasing awareness through environmental education activities is recognized.

Overall, these references emphasize the importance of legislative actions in South Punjab, Pakistan, to combat pollution and encourage environmental education. Lessons from neighboring regions, such as Punjab, India, may be drawn, and the issues created by urbanization and air pollution must be addressed by comprehensive legislation and monitoring systems.

Material and Methods

There are different techniques and wellsprings of examination to acquire data pertinent to assessing strategy estimates connected with contamination and ecological training in the Punjab locale of Pakistan. The survey, right off the bat, utilizes an extension-based research approach (Levac and Partners, 2010). Exploring the point assisted with planning current writing and tracking down pertinent subjects. Utilizing this system, specialists distinguished and fostered an extensive variety of strategy estimates connected with brown haze and environmental schooling in southern Punjab. Besides, this audit was led with efficient survey strategies (Masalimova et al., 2023). An efficient survey is a complete and methodical quest for the writing containing every single important review. With this methodology, analysts had the option to find and examine patterns in natural schooling strategies and exercises in southern Punjab. Moreover, the review utilized blended strategies methods (Enwin and Dawaye 2023). Blended strategies research incorporates techniques for gathering and examining information from both subjective and quantitative sources. This survey depends on a subjective examination system (Franco et al., 2018). Studies, strategy audits, writing surveys, and other subjective exploration techniques give profound experiences into the accomplishments of environmental activity and deficiencies of current practices. Generally, speaking, the survey joins a scope of checking studies, methodical audits, blended techniques, and subjective exploration

strategies to get data on smog and natural training strategy drives in southern Punjab, Pakistan.

Discourse Analysis

The research studies deemed to elaborate reasons of Smog prevailing in the globe. The outcomes of these researches stress anthropogenic activities and urbanization as the primary causes of smog in South Punjab, Pakistan. The usage of fossil fuels, stubble burning, excessive chemical fertilizer use, and industrial waste all contribute significantly to pollution in Punjab across the borders (India & Pakistan) (Kaur & Singh, 2022). The rapid migration of people to cities, changed into consumption habits, and uncontrolled urban and industrial expansion have all contributed to the problem of air pollution (Ali & Athar, 2010). Furthermore, the development of urban areas and the increase in traffic emissions in major cities such as Multan, Bahawalpur, Lahore, Faisalabad, and Karachi have aggravated the problem (Mehmood, 2018). Smog has far-reaching repercussions in South Punjab's metropolitan regions. Smog in Lahore, for example, is a major public health hazard (Riaz & Hamid, 2018). Smog-induced poor air quality causes respiratory difficulties, cardiovascular disease, and other health concerns. Smog has enormous socioeconomic consequences (Rana & Bhatti, 2018). The agglomeration economies of Punjab's largest cities, particularly South Punjab, are impacted by high population density, unemployment, and expensive housing, all of which are compounded by smog and air pollution (Ghafoor et al., 2021). Furthermore, urbanization difficulties such as a lack of coordinated urban development strategies, uncontrolled urban expansion, and inefficient building regulation exacerbate the situation (Rana & Bhatti, 2018).

Specific case studies or incidents of smog in the region

Smog occurrences in Pakistan's South Punjab region owing to a variety of circumstances that are: a) Burning crop wastes, for example, emits aerosols and contributes to the alteration of aerosol characteristics and the production of smog (Kaskaoutis et al., 2014). Burning crop leftovers not only degrades local air quality but also causes smoke plumes to travel great distances, harming a larger area. This study also underscores the damage to air quality presented by crop residue burning in South Asia, particularly Punjab.

Indoor air quality is another factor that leads to haze in South Punjab's metropolitan centers. Colbeck et al. (2018) conducted research on regional and temporal variability in indoor air quality in Multan, Bahawalpur and D.G.Khan in South Punjab and identified that cooking, cleaning, smoking, and penetration from external sources are key contributors to interior air pollution, which can add to the region's total smog levels.

Crop residue burning, particularly the burning of paddy crop leftovers, contributes significantly to smog generation.

These findings highlight the need of addressing the unique sources of pollution in the region through tailored actions. Efforts to limit crop residue burning, promote alternative farming practices, and enhance indoor air quality can all assist to lessen the frequency and intensity of smog in South Punjab's metropolitan centers.

Environmental Education in South Punjab

Stern et al. (2013), Carleton-Hug and Hug (2010), and Ardoin et al. (2020) conducted researches to assess the effectiveness of youth environmental education programs. This

investigation implies the efficacy of environmental education programs. Zakharova et al. (2021) identified that the ecological knowledge of indigenous peoples seemed to be enhanced which seemed to help them to take preemptive measure for its spread. Yaqubi (2023) explores that the Ministry of Education's involvement in promoting environmental conservation is essential to be taken from tertiary level of learning. Understanding the involvement of educational institutions and government activities can help assess the quality and efficiency of environmental education programs in South Punjab. To summarize, a thorough knowledge might be acquired of the state and efficacy of environmental education programs in South Punjab, Pakistan, by synthesizing the information from these researches. These studies shed light on program assessment, outcomes, obstacles, effective content and methodologies, and the role of educational institutions and government activities in environmental conservation.

Role of education in raising awareness about environmental issues

Environmental education seeks to develop persons who have a thorough grasp of the environment, its constituents, and the links that exist between them. It also tries to instill a sense of responsibility for environmental concerns and to prevent natural life from deteriorating (Sinan et al., 2022). In the long run, this understanding can lead to pro-environmental behaviours, particularly among young people (Khuc & Tran, 2022). In South Punjab, Pakistan, education is critical in developing awareness about environmental challenges (Kousar et al., 2022; Ganatsa et al., 2021). Natural education programs inflict major influence on individual environmental awareness, attitudes, and behavior, ultimately contributing to sustainability (Genç, 2014). Furthermore, as shown in Turkey and Canada, introducing environmental initiatives within the education sector has been demonstrated to be useful in raising awareness (Tariq et al., 2020). Furthermore, environmental awareness modules should be included in teacher training programmes to ensure that educators have the knowledge and abilities to successfully teach and promote environmental awareness (Sultan et al., 2020).

Pre-Emptive Measures and Policies

A Review of existing policies and initiatives aimed at preventing or mitigating smog in South Punjab, Pakistan is presented to clarify governmental policies and seriousness towards the issue (Pervaiz et al., 2020). Following preemptive measure are currently taken in the Punjab (Pakistan):

- Policies restricting crop residue burning and industrial pollutants are prohibited for cold months to reduce haze in South Punjab.
- The brick industry contributes significantly to air pollution in Punjab, notably South Punjab. An integrated study of the brick sector's influence on air quality reveals that reducing emissions from this sector might help to improve air quality (Pervaiz et al., 2021). Stricter controls and the promotion of cleaner technology in the brick industry is taken on the part of a beneficial policy effort by the Punjab Govt. to reduce pollution.
- Vegetation is critical in reducing air pollution and enhancing air quality. The provincial government has ordered to use greening methods, plant screens, and barriers in South Punjab which seemed to help buffer urban heat and reduce air pollution-related mortality (Khan et al., 2022).

- Implementing measures may be taken on the part of the individuals through environmental awareness that target interior air pollution sources, such as cooking and heating practices, might help to enhance overall air quality and reduce smog.

Analytical Discussion

Analytical discussion is furnished to show implementation of policies and activities aimed at avoiding or reducing smog in South Punjab, Pakistan are considered below:

- The Punjab EPA releases reports on air quality and the success of policies and actions in tackling pollution concerns on a monthly basis. These reports give significant insights on South Punjab's efforts in eliminating smog and improving air quality.
- Academic studies undertaken by scholars and subject matter specialists can give useful information at how laws affect crop residue burning, industrial emissions, the brick industry, and interior air pollution.
- Governmental entities in charge of implementing and monitoring environmental regulations may produce reports and evaluations of their projects' efficacy. These studies can offer an overview of South Punjab's success, issues, and future plans for smog prevention and mitigation.
- Global entities like the World Health Organization (WHO) and the United Nations Environment Program (UNEP) frequently perform evaluations and make tips for how to reduce air pollution. Their reports and publications can provide information about the efficacy of policies and activities implemented in South Punjab.
- Case studies from other places or nations dealing with comparable smog-related issues can also give significant lessons and insights. Researchers can assess the efficiency of policies and activities aimed at avoiding or reducing smog in South Punjab, Pakistan, by analyzing these potential references. The connection between environmental education and the adoption of pre-emptive smog measures are given as under:

Environmental education and smog reduction

Environmental education can fundamentally lessen contamination. Educational instruction can assist with defeating ecological hindrances and support the utilization of exhaust cloud decrease techniques. Kollmus and Agyeman (2002) focused on the significance of perceiving obstructions to advancing natural ways of behaving and how ecological schooling can dispose of these boundaries. Ecological schooling can emphatically affect decreasing smog by teaching individuals unambiguous measures to lessen brown haze contamination, like diminishing energy utilization and supporting feasible vehicles. Ecological training can raise public mindfulness and worries about the well-being and natural impacts of haze contamination and consequently offer more noteworthy help for strategy and measures to decrease haze.

Finally, enhanced environmental education has the potential to make a large contribution to smog reduction. Environmental education can empower individuals to take action against smog pollution and contribute to a cleaner and healthier environment by addressing barriers to pro-environmental behavior, bridging the gap between

intentions and impacts, raising smog awareness, and promoting the adoption of protective behaviors.

The key findings

- The need for thorough awareness programs and adequate policy implementation in South Punjab, Pakistan, to reduce the adverse consequences of pollution.
- The beneficial effect of lowering pollution sources such as crop residue burning and industrial emissions on improving air quality.
- The brick sector's considerable contribution to air pollution in Punjab, notably South Punjab, and the possibility for improving air quality by addressing emissions from this sector through stronger restrictions and cleaner technology.
- The value of urban greening and plant cover in reducing pollution and improving air quality in South Punjab.
- The identification of interior air pollution as a threat, as well as the necessity for laws that target indoor air pollution sources, such as cooking and heating practices, in order to enhance overall air quality and lower smog levels.

These important findings emphasize the significance of a multifaceted strategy to smog prevention and mitigation in South Punjab, which includes raising awareness, regulating pollution sources, supporting cleaner technologies, increasing plant cover, and tackling indoor air pollution. South Punjab may aim to reduce pollution levels and improve the region's overall environmental health by implementing evidence-based policies and efforts in these areas.

Findings on Key Policy areas and education programs

- Public approval of smog-control programs is critical to success in environmental education. Govt Officials in South Punjab should focus on developing ecologically friendly and equitable policies, as well as successfully conveying the advantages of these policies to the population.
- The brick industry has been highlighted as a major source of air pollution in Punjab. Pervaiz et al. (2021) emphasize the significance of addressing the brick industry's influence on air quality. Adoption of cleaner technology and enhanced emission control systems should be promoted by policies and education programs aimed at this industry.
- Population-based research in South Asia, including Pakistan, indicated the need for long-term solutions to air pollution. Jabbar et al. (2022) emphasize the need of addressing sustainability in air quality policies and programs. Measures to minimize carbon dioxide emissions and encourage sustainable practices in several areas are included.
- Importance of plants in enhancing air quality and public health should be acknowledged. Khan et al. (2022) conducted an empirical research in Lahore that demonstrated the beneficial effects of vegetation on urban air quality. To alleviate the consequences of smog pollution, policies and education programs should encourage the planting and maintenance of trees and green areas in South Punjab.

Overall, potential areas for improvement in South Punjab, Pakistan smog policies and education programs include increasing public acceptance of smog-controlling policies,

Conclusion

Smog pollution is a major environmental issue in metropolitan areas of South Punjab, Pakistan. Rapid urbanization and industry in places such as Lahore have led to deteriorating air quality and widespread pollution. Smog exposure can lead to serious health problems such as respiratory and cardiovascular illness.

The principal sources of smog in South Punjab were investigated in this review research, which included agricultural residue burning, industrial pollutants, and traffic pollution. Case studies focused on the effects of practices such as rice crop residue burning and indoor air pollution on smog levels. Smog's effects go beyond public health, causing socioeconomic difficulties as well. Addressing smog necessitates a broad strategy that includes reducing pollution sources as well as improving rules and regulations.

Environmental education is critical in raising awareness and taking preventative steps against pollution. Environmental learning in South Punjab is now affected by issues such as regional socio-cultural dynamics, a lack of basic amenities, and gender imbalances. Educational institutions are responsible for empowering individuals via knowledge and encouraging pro-environmental behavior. Environmental stewardship may be effectively promoted through innovative teaching practices that include local settings.

An examination of current laws revealed the significance of extensive awareness campaigns, appropriately implementing restrictions on industries such as brick kilns, and boosting public approval of efforts. International case studies gave useful insights on techniques to reducing smog that have been effectively implemented elsewhere. Overall, a multi-pronged strategy involving laws, incentives, and outreach to address sources such as agricultural residue and indoor air quality is required.

Despite continuous efforts, there are still chances in South Punjab to increase environmental policies and education. Initiatives must prioritize sustainability, close knowledge gaps on issues such as water pollution, strengthen educational infrastructure, and stimulate cross-sector collaboration. Regular assessments can help lead evidence-based changes.

Finally, governments, practitioners, and communities must move quickly and together to address pollution in South Punjab through prevention, mitigation, and education. Holistic solutions that take into account local socioeconomic circumstances have the potential to preserve public health and pave the path for a cleaner, greener future. Continued study and monitoring can help to bolster these efforts.

Recommendations

In the light of analytical references, literature review discourse analysis and discussion following recommendations are given:

- It is recommended that smog avoidance and environmental education are critical for tackling South Punjab, Pakistan's environmental concerns.
- It is critical to analyze the elements impacting education and environmental awareness in the region in order to give meaningful advice to policymakers and stakeholders.

- One of the most important recommendations is to examine urban population's degree of education and understanding about water quality, usage, and conservation. The study by Qasim et al. (2018) shows the lack of water education and appropriate water policy, which endangers Punjab's future.
- Recommendation about Crop residue burning in South Punjab's environmental concerns is to stop these practices immediately to avoid releasing toxins into the atmosphere. Policymakers should priorities stringent controls and the promotion of alternate agricultural waste management practices, such as composting or utilizing it as a source of renewable energy. Singh and Kaskaoutis (2014) emphasize understanding the dynamics of atmospheric aerosols and the production of fog and smog over the Indo-Gangetic Plain (IGP), which is roughly 900 km southeast of Punjab.
- Educational infrastructure and quality of education in South Punjab must be addressed. Zulfiqar (2020) advocates raising the educational budget, strengthening infrastructure, offering scholarships to poor children, and recruiting skilled instructors to improve primary school enrolment rates.
- Government may increase community participation and outreach programs, in addition to formal education along with environmental education. Aman et al. (2022) emphasize the necessity of building collaborations between community people, educational institutions, and essential stakeholders in order to implement environmentally friendly policies.
- Finally, authorities and stakeholders in Pakistan's South Punjab should priorities pollution reduction and environmental education. They may develop a sustainable and ecologically conscious society by tackling issues such as water education, crop residue burning, educational infrastructure, and community participation.

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