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ORIGINAL CONTRIBUTION

Navigating Urban Environmental Hazards: Policies and Pathways to Health Equity in Pakistan within the Framework of Sustainable Development Goals

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Abstract— A Potential Time Bomb, as discussed in our study, has serious urban environmental risks in Pakistan, particularly in achieving the Sustainable Development Goals (SDGs) (UN). Rapid urbanization has led to higher pollution, insufficient waste management, and stressed infrastructure, disproportionately hurting communities with limited resources and impeding progress toward health equity. Our research has significant limitations that must be understood. Our analysis studies explore how inequality affects environmental threats in Pakistani urban areas, particularly Lahore. Our team discovered facts about pollution by speaking with residents. Our findings show that effective environmental protection needs both city planning and community efforts, plus national government rules.

Index Terms— Urbanization, Environmental hazards, Health equity, Sustainable Development Goals (SDGs), Environmental justice, Urban sustainability, Socioeconomic and political dimensions, Policy gaps

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Introduction

Urbanization in Pakistan grew quickly during recent decades, creating major environmental problems that directly affect public health. Karachi and Lahore face serious weather issues alongside polluted water and excessive air pollution, which worsen health inequality among their residents. SDGs 3 and 11 work directly to address urban health problems as part of the United Nations' Sustainable Development Goals, which help us achieve health equity.

Urban environmental hazards in Pakistan

Pakistani cities face serious environmental problems because of polluted air. Solid waste burning and industrial pollution, together with vehicle exhaust, have pushed Karachi and Lahore into the top ranks of polluted cities worldwide (Iqbal, 2023). The annual pollution in

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Lahore is alarming since it harms respiratory and cardiovascular health. Water poisoning is another critical issue. Untreated sewerage waste and industrial waste continue to contaminate water sources, endangering human health. According to research, more than 80% of Pakistan's wastewater is discharged in the wrong way, which increases the risk of waterborne illnesses (Khan, 2021). Water contamination has an especially bad effect on the health of vulnerable communities where access to clean drinking water is limited.

Health impacts and parity problems

Urban environmental problems are exacerbated by extreme weather events, which are made worse by climate change. For example, during the past ten years, Karachi has seen extraordinary heat waves with temperatures above 45°C, which have led to hundreds of heat-related deaths. (Ali, 2023). Furthermore, many people have been evacuated by urban floods caused by monsoon rains, and the frequency of waterborne infections has grown, particularly in low-income regions. (Ahmed R. S., 2022).

These environmental hazards have worse effects on health. Higher rates of heart illness, obstructive pulmonary, and chronic disease are all closely interlinked with air pollution. (Rehman, 2022). Especially vulnerable are the elderly and children, whose rates of death and sickness have been shown to increase rapidly during the passage of heavy pollution (Iqbal, 2023). Children under five are excessively affected by water pollution, which increases gastrointestinal infections, waterborne ailments, and the risk of hepatitis. (Khan, 2021). Due to limited access to healthcare, many health problems are increased in low-income populations. Urban floods and heat waves are two climate-related issues that have made public health more of a load. Because of subpar housing and restricted access to emergency services or cooling systems, vulnerable groups—including those living in informal settlements—suffer more. (Ali, 2023).

Implementation of policies and pathways to health equity

The robust policy and Effective implementation frameworks are required to address urban environmental concerns as well, and the strategies for lowering environmental hazards have been suggested by Pakistan's National Climate Change Policy (2012) and later provincial efforts, and their enforcement is still a major obstacle, (Ahmed S. J., 2022). Measures including encouraging cleaner fuels, enhancing public transportation, and enforcing stringent industrial emission laws are essential to combating air pollution. Although its scalability has not yet been shown, the Punjab government's deployment of electric buses in Lahore is a promising start. (Rehman, 2022). Significant investment in wastewater treatment facilities is necessary to improve the quality of the water. Public awareness programs and community-driven water management projects can greatly aid in the decrease of waterborne illnesses. (Khan, 2021). Increasing urban green areas, improving drainage systems, creating heat action plans, early warning systems, and community-based disaster preparedness programs can increase resilience, especially in at-risk regions; improving drainage systems, expanding urban green spaces, and creating heat response plans are critical components of climate adaptation. (Ali, 2023).

Alignment with sustainable development goals SDGs

The difficulties presented by urban environmental dangers emphasize how crucial it is to match national policy with Sustainable Development Goals. While SDG 11 promotes resilient and sustainable urban development, SDG 3 emphasizes the value of health and well-being. Sustainable development may be improved by integrating these objectives into Pakistan's public health and urban planning plans. An effective role is also played by worldwide cooperation. Relationships with global organizations might offer financial and technical assistance for productive environmental health programs. Pakistan's policy solutions can be further improved by exchanging information with nations dealing with comparable problems. (Ahmed S. J., 2022).

Research gap

Research needs more information about how socioeconomic differences affect urban environmental risks and health disparities in Pakistan. Research about environmental hazards neglects how vulnerable groups, especially poor neighborhoods, suffer disproportionately from these problems. Research shows that Pakistani cities need better environmental management and health equity policies because of current implementation problems. Scientists need more data about successful community-led approaches and community programs for dealing with environmental hazards. The ways that poverty and healthcare access influence environmental risks remain unclear for urban Pakistan.

Statement of the problem

There is a significant advancement in understanding urban environmental hazards, but there is always a gap in addressing the risks of socioeconomic dimensions. The proper implementation of policy and urban planning fails to help the marginalized and vulnerable

communities, causing excessive exposure to environmental risks. With a particular focus on low-income and marginalized populations, this study examines the social and economic factors that influence unequal degrees of exposure to urban environmental hazards. This research's central problem is the lack of equitable and inclusive urban planning strategies that can effectively mitigate environmental hazards while promoting social justice. By examining case studies from various global cities, this study aims to identify best practices and policy recommendations that can inform more inclusive and sustainable urban development.

Research questions

The present study attempts to answer the following questions: 1. What are the primary environmental hazards prevalent in urban Pakistan that significantly impact the health and well-being of its citizens? 2. In what ways do these environmental hazards contribute to the deterioration of citizens' health and well-being? 3. What are the perceptions of citizens towards governmental environmental policies aimed at mitigating these hazards and safeguarding their health and well-being? 4. How can effectively addressing these environmental hazards contribute to the advancement of the SDG related to health and well-being?

Sociological significance of the study

Research into urban environmental hazards shows major social value because it reveals how these threats affect different city residents and create unfair social differences. The urban environment creates more damage in neighborhoods where poor people and vulnerable residents live and makes their social struggles worse. People with low incomes and minority groups who face disadvantages tend to live in neighborhoods with poor environmental conditions and weak resources to fight climate change effects. (Hassan, 2021). Environmental risk patterns reflect social inequalities and demand research on how economic standing shapes environmental exposure.

Empirical significance

Our research aims to show how urban environmental risks affect cities across measurable benchmarks. The study measures pollution levels in air and water and checks waste system performance while examining how climate change impacts urban areas. (Zhang, 2019). Our research will show exactly where environmental risks appear and what impact they have on urban residents' well-being and economic status. Our extensive data collection serves multiple essential purposes. Identifying specific locations with the highest aid demand is the first use of this approach. It works as a starting point to test the results of our ongoing policy efforts over time. When community groups and NGOs use solid evidence, they can strengthen their requests for change through their advocacy work. A study takes on meaning through data that helps officials make better choices to protect public health and reduce urban dangers.

Theoretical framework

My study uses SDG 3 and SDG 11 together with environmental sociology and urban ecology to form its scientific base. The integrated approach helps us understand how environmental risks affect both social inequality and public health at urban levels.

Environmental justice theory

This work focuses on Environmental Justice Theory because it explains how disadvantaged people face greater danger from environmental threats. Researchers focus on showing how environmental risks and health problems spread unevenly across society because of differences in income level, education, and resource availability. The framework displays how health differences grow when public policies and unequal systems fail. Studies of environmental justice help us understand why low-income neighborhoods in Pakistani cities face worse environmental problems. Our framework lets us examine how society blocks people from using available resources equally during healthcare in clean environments.

Urban Political Ecology (UPE)

Urban political ecology brings forth essential sociopolitical insights about how communities shape metropolitan areas. Environmental dangers in Karachi and Lahore persist because of urban growth combined with industrial activities plus government decisions. UPE helps us understand how public policies make urban environmental risks better or worse when power differences and poor governance lead to environmental destruction. The research looks into how city planning and policy decisions impact the health and quality of life of urban residents, especially those in disadvantaged groups, using this framework. For effective environmental safety solutions, governments must involve all people in their decision-making process.

Health Equity and Social Determinants of Health (SDH)

Our research requires fair healthcare because it helps achieve SDG goals 3 and 11. Through its Social Determinants of Health framework, this study examines how living situations, health services, and environmental conditions influence both health results and health disparities. Our health equity efforts require us to integrate public health methods with urban development principles to handle environmental threats and social challenges.

Sustainable Development Goals (SDGs) framework

Our research helps achieve global health equality and sustainable city goals through the complete SDGs framework. SDG 11 helps cities build safety zones, and SDG 3 promotes better health while decreasing health disparities. Our research methods link to global sustainability goals by looking at how urban challenges impact both people and nature.

Utilizing the framework

This research combines multiple theoretical methods to examine how social-political and economic factors influence urban environmental risks. Investigate how minority group members experience greater environmental dangers than other people. Explore how the government manages environmental risks and how the public helps make decisions. Support Pakistan's cities in achieving equal health care by using local action plans that connect neighborhood work with global sustainability targets. By integrating various methods, our study delivers results that apply globally while remaining relevant to specific urban settings.

Literature Review

Innovative approaches help us solve health fairness issues while working with SDGs to manage urban danger from the environment. To achieve health equality and urban sustainability we need to connect water management with urban design while tracking resilience indicators. Our actions align with SDG-11, which promotes sustainable urban development, and SDG-6, which works for clean water and sanitation.

Resilience and Sustainable urban development in Pakistan may be improved by including resilience indicators like executive management, risk management, and community resources. Help the communities and indicators prepare and respond to emergencies, which ensures that there is a balanced distribution of resources and that the implementation of policy is working effectively. Community resilience must be strengthened to achieve SDG-11 since it enhances economic, social, and ecological sustainability. (Ahmed R. S., 2022).

Another major cause that has an impact on health hazards is the decline of water quality in Pakistan, which impedes the attainment of SDG-6. Not only urban but also rural people are impacted by contaminated water, which calls for immediate legislative changes to guarantee access to clean water. Water resource conservation and public health can be improved with the adoption of smart irrigation technology and other effective water management strategies. (Ishaque, 2024).

The path to health equality and sustainable cities combines water management with urban design and resilience measurement (Rydin, 2012). Our work follows both SDG-11, which supports sustainable communities and SDG-6, which focuses on water quality and sanitation (Nations., 2015). Pakistan can enhance its resilience and sustainable urban development by using organizational leadership methods and community asset management alongside risk management (Cutter, 2010). Communities and indicators need emergency preparation and response support to guarantee fair resource distribution while making sure policy works properly (Tierney, 2012). SDG-11 requires us to build stronger communities because this practice supports economic health and improves both social and environmental systems (Magis, 2010). The decreasing quality of water in Pakistan creates health risks and blocks progress toward SDG-6, according to (Bhutta, 2018). Both urban and rural communities need clean water now and require new laws to ensure everyone gets safe drinking water (Shafique, 2020). Smart irrigation and water management techniques help protect our water supply while keeping people healthy (Kumar, 2020)These urban contexts create disproportional health inequities in Pakistan because of crumbling infrastructure, fewer green spaces, and poor air quality. Vulnerable, marginalized people are most affected by these situations; thus, inclusive urban development is critical. Delivering policies that target the social and environmental determinants of health can reduce urban health hazards and promote health equity, such as air pollution and available public spaces. (Kjellstrom, 2007).

The goal is to achieve urban health equity through water management and resilience; however, it is also important to consider the larger background within which these global topics are concerned: the global economy and climate change. These factors weigh heavily on urban health and sustainability, making integrated strategy support of global efforts for sustainable development and health equity necessary. (Friel, 2011).

Methodology

A qualitative research methodology was used to investigate the impacts of environmental hazards on low-income communities in Lahore. Collection of data from the marginalized populations that are directly affected by these environmental hazards through in-depth interviews in the framework of Sustainable Development Goals (SDGs).

Research design

This research employs a qualitative, exploratory design to develop a full understanding of the socioeconomic and health-related impacts of urban environmental hazards on vulnerable populations. It allows for an in-depth and sensitive investigation of participants' lived experiences, perceptions, and coping strategies through rich, qualitative data collection.

Study area

The research paper will be conducted in Lahore, Pakistan. The focus under consideration is specific areas of this urbanized and, therefore, environmentally stressed city according to site choice criteria set out by high environmental hazard exposure (e.g., air pollution, water contamination, poor waste management, and extreme weather) and location factored on income level within low-income neighborhoods. These areas will be verified by both existing environmental and socioeconomic data, as well as by local government and community organizations.

Data-collection techniques

Through in-depth interviews, we collected data from participants who belong to low-income residents of Lahore. Our efforts were directed towards including people with diverse demographic variables, such as elderly people, women, and households with chronic illnesses, to capture diverse experiences of vulnerability.

The tool that was used in this research was a semi-structured interview guide that will have questions to awareness and perceptions about urban environmental hazards, such as air pollution and water contamination extremes in weather; the health and socioeconomic impacts of such hazards; Coping strategies and adaptive measures the household employs in dealing with the hazards; Perceptions about governmental and non-governmental interventions concerning these hazards. Sample Size: About 20 interviews were conducted using purposive and snowball sampling.

Data analysis

Qualitative data collected from interviews and observations were analyzed using thematic analysis. Data were then transcribed verbatim, coded, and categorized into thematic areas around urban environmental hazards, health equity, and socioeconomic implications. Participants will receive thorough information about the study, including its purpose, methods, and their right to withdraw at any point, and will provide informed consent. Consent can be in writing or orally.

Thematic analysis was used to analyze the qualitative data collected through interviews and observations. Then, data were transcribed verbatim, coded, and categorized into key themes related to urban environmental hazards, health equity, and socioeconomic impacts.

Ethical considerations

Informed consent was obtained from the Participants before interviews and detailed information on the research study. Consent was taken in both verbal and written form. This was done to ensure confidentiality, avoid exposing personal identity, and respect cultural values and norms during the data gathering.

Alignment with the SDGs

This study aligns with SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities). The lived experiences of vulnerable populations and assessing the effectiveness of existing practices can be identified, the research explores to contribute actionable insights to promote health equity and sustainable urban development. To understand the interactions among urban environmental risks, this approach helped set a strong base for health inequalities and socioeconomic susceptibilities in Lahore's impoverished communities.

Analysis

Through in-depth interviews, the analysis of qualitative data was collected from the participants belonging to low-income areas in Lahore, revealing key themes surrounding urban environmental hazards, their health implications, and socioeconomic status. Several themes emerged from contextualizing all these findings. Urban environmental hazards such as air pollution, water contamination, extreme weather events, and insufficient waste management were identified as key concerns and major hazards. Participants explained their views on the impact of vehicle emissions, poor sewage systems, and industrial effluents on air and water quality. The results of our studies match the last studies, which indicated that some of the worst air quality in the world is found in places like Lahore. Participants observed frequent pneumonia, heat-related illnesses, and waterborne diseases, indicating the worse effects of environmental hazards on health.

Several families described that due to poverty, they do not have enough resources, which causes medical crises. The efforts performed by government and non-governmental organizations. The majority of participants were unsatisfied with government initiatives, citing insufficient enforcement of industrial emissions limits and a lack of investment in wastewater treatment. In contrast, community-led programs were projected to be more effective in decreasing environmental dangers.

Lastly, participants described a range of ways to cope with environmental risks and lessen their effects, such as forming unofficial community networks, storing water in tanks, and using face masks. These actions have been considered inadequate and unsustainable over time.

Discussion

Urban environmental hazards affect vulnerable groups in Lahore, Pakistan, as our study shows, and how they relate to the Sustainable Development Goals (SDGs) The findings highlight the close relationship between environmental deterioration, economic disparities, and health inequalities. (Corburn, 2009). This chapter addresses the important findings, places them within the existing research, and provides an analysis of policy frameworks and adaptation methods.

Urban environmental hazards and health inequities

According to the research, there is air pollution, water contamination, extreme weather events, and insufficient waste management. These dangers can indirectly arm vulnerable groups or underprivileged groups, magnifying existing health disparities. Health differences between disadvantaged groups can worsen when environmental risks affect these communities. (O'Neill, 2003)The research aligns with previous studies that highlighted the alarming levels of air pollution in urban centers like Lahore and Karachi, causing respiratory and cardiovascular diseases. Research findings support past studies that show high pollution levels in Pakistani cities like Lahore and Karachi make people sick in their lungs and hearts. (Gehring, 2018) Water pollution is recorded as a serious issue, especially for children under the age of five, who are particularly exposed to digestive and waterborne infections. (Bora, 2018) . Hazards create more health problems for people at risk, which makes health differences worse and prevents us from meeting SDGs 3 and 11 (Nations, 2019).

Worse changes in climate are due to extreme weather events, which increase the vulnerability of low-income people to socio-political and economic factors reported similar findings, underlining the effects of urban heatwaves and flooding on public health and socioeconomic stability. These environmental dangers increase the challenges of disadvantaged populations who lack enough means for adaptation or access to healthcare, as evidenced by the findings of this study.

Socioeconomic dimensions and policy gaps

Our Research Found Both Social and Economic Problems Plus Government Deficiencies

Our research revealed that poverty combined with bad housing and limited healthcare access made environmental dangers worse across all socioeconomic levels. People mentioned money issues as the reason they did not receive medical care, which demonstrates that social divisions increase environmental problems (Beck, Risk Society: Towards a New Modernity, 2019). Participants condemned the government's inability to control industrial emissions and improve wastewater management despite promising measures like the introduction of electric buses in Lahore. (Rehman, 2022). Research shows that social differences such as poverty and healthcare problems make environmental risks worse (Beck, 2019). Those without enough money cannot receive medical care, so social inequality helps environmental issues to grow (Kjellstrom T. L., 2006). Financial problems blocked many people from getting medical treatment, which shows that social inequality makes environmental problems worse (Bullard, 2000).

Community-Led initiatives and adaptation strategies

To reduce the environmental threats, some Community-driven initiatives, such as informal networks and localized water management methods, have been considered more effective. In some cases, these techniques are frequently insufficient and unsustainable in the long run, mirroring research on the necessity of community resilience in attaining sustainable urban growth. Studies show that localized water management methods and informal community networks work better than standard programs to fight environmental dangers. (Adger, 2005) .Research shows that sustainability in urban development requires more than these methods because they do not work well in the future (Berkes, 2003). The strong and inclusive urban design initiatives are important for the participants' adaptation measures, such as face masks and water storage, highlighting the importance of building (Tanner, 2015) These are consistent with Urban Political Ecology and Environmental Justice Theory, which both emphasize the role of governance and sociopolitical institutions in shaping environmental results.

Alignment with sustainable development goals

The report underlines the need to align national policies with SDGs 3 and 11 (Good Health and Well-Being and Sustainable Cities and Communities, respectively). Combining responses to urban environmental dangers produces better health fairness and makes cities more resilient (Organization., 2016). Global collaboration might give financial and technical assistance to Pakistan's environmental health programs, resulting in a more sustainable and equitable future.

Limitations

Our research has important limitations that must be understood. A small sample of 20 people limits our ability to apply these results everywhere, while diverse urban areas need to be tested to understand present data. Based primarily on what people report they experience, they may not remember accurately, so our findings could be less precise. The research focus on the Lahore area makes it harder to apply the results to Pakistan's different urban environments across their unique socioeconomic and environmental settings. The study's simple snapshot approach fails to reveal important long-range effects of urban environmental dangers.

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Recommendations

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Conclusion

Our research paper "Navigating Urban Environmental Hazards; Policies and Pathways to Health Equity in Pakistan within the Framework of Sustainable Development Goals" looks at Pakistan's urban health problems through Sustainable Development Goals. Our study explains that urban areas experience multiple environmental dangers that affect people's health, most strongly in poor neighborhoods, due to pollution issues. The research shows we need better solutions and policies to protect the health of all people.

Research shows environmental threats relate strongly to economic and social circumstances. Studies show that disadvantaged groups suffer most from environmental risks because they live near contaminated areas while lacking the needed funds for protection against future threats. Our findings show the need for complete urban planning that puts environmental fairness first. The study shows that letting local residents participate in creating environmental policies creates better results that last over time.

This research supports SDG 3 which works to create better health systems and improve overall well-being for everyone. It helps us reach our 2030 Agenda objectives by revealing how city environmental issues impact our health and equality. The research supports creating new environmental rules, better waste handling, and better transportation systems alongside public participation in decision-making. These solutions protect residents from environmental hazards while making quality healthcare available to everyone who lives in Pakistani cities.

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