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An Overview about the Challenges of Urban Expansion on Environmental Health in Pakistan

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Abstract
Urbanization, as the physical expansion of urban areas, presents significant challenges globally. In Pakistan, urbanization and environmental problems have emerged as critical developmental issues. This study aims to investigate the impact of urbanization on the environment, utilizing secondary data gathered from a wide range of sources including books, journals, magazines, published and unpublished dissertations, newspapers, the internet, and various institutions focused on urbanization and environmental issues. The complexities of urbanization and its environmental consequences are intricate and interconnected, making them difficult to fully understand and articulate. The study seeks to elucidate these connections by examining how urbanization influences various aspects of the natural environment in Pakistan. Key environmental concerns linked to urbanization include air pollution, water pollution, land pollution, noise pollution, deforestation, and climate change. Each of these issues poses a significant threat to the health and well-being of both the environment and the population. Air pollution, for instance, is exacerbated by increased vehicular emissions, industrial activities, and the proliferation of construction projects in urban areas. This leads to higher concentrations of harmful pollutants in the air, which can cause respiratory problems and other health issues among urban residents. Similarly, water pollution arises from inadequate waste management systems, industrial discharges, and the runoff of urban pollutants into water bodies, compromising the quality of water resources and affecting aquatic ecosystems. Land pollution is another pressing issue, with urbanization leading to the accumulation of solid waste, the spread of illegal dumping sites, and the degradation of land quality. Noise pollution, often overlooked, is prevalent in rapidly growing urban areas, resulting from traffic, construction, and industrial activities. This type of pollution can lead to a range of health problems, including stress, hearing loss, and sleep disturbances. Deforestation, driven by the need for land to accommodate expanding urban populations, further exacerbates environmental degradation. The loss of trees and green spaces not only affects biodiversity but also contributes to climate change by reducing the amount of carbon dioxide that can be absorbed from the atmosphere. Climate change, in turn, poses severe risks to urban areas, including increased frequency and severity of extreme weather events, rising temperatures, and altered precipitation patterns. The findings of this study are intended to inform the development of effective strategies and policies to address the environmental impacts of urbanization in Pakistan. By understanding the multifaceted relationship between urbanization and environmental degradation, policymakers can implement measures to mitigate these effects. This may include promoting sustainable urban planning, enhancing waste management systems, investing in green infrastructure, and enforcing regulations to control pollution and protect natural resources.
Keywords: Urbanization, Environmental Impact, Pollution, Deforestation, Climate Change
JEL Codes: Q56, R11, R14, O18

1. INTRODUCTION

Urbanization refers to the expansion of urban regions driven by global changes. It involves the movement of people from rural to urban areas, often associated with population growth and migration to urban centers. According to estimates by the United Nations, approximately half of the world's population resided in urban areas by the end of 2008. Urbanization is closely tied to processes of transformation and industrialization, as well as sociological phenomena such as urban migration. It can be seen as a multifaceted process that encompasses changes in infrastructure, economy, culture, and social dynamics within urban areas. At any given time, urbanization can depict a specific state or condition, reflecting the ongoing evolution of urban environments. This includes factors such as urban planning, land use, transportation, housing, and the distribution of resources and services within cities. Urbanization represents a complex and dynamic phenomenon shaped by various social, economic, and environmental factors. It plays a significant role in shaping the modern world and has profound implications for global development, sustainability, and quality of life in urban areas. The term urbanization refers to the percentage of the total population living in cities or the growth of this proportion over time. It can also indicate the period during which the urban population is increasing (Bibi, 2012). The environment encompasses the sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for

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development and growth as well as potential dangers and damage. Environmental issues arise from human activities that cause harm to the environment. Environmental pollution refers to any solid, liquid, or gaseous substance present in concentrations that may be, or tend to be, injurious to the environment (The Free Dictionary, 2014).

The environment encompasses all factors that influence an organism throughout its life, and in turn, all organisms, including humans, have an impact on their environment. With the increase in the human population, the natural ecosystems of the Earth are experiencing significant stress. The phenomenon of urbanization is exacerbating environmental problems, as the current rate of population growth has led to areas experiencing famine where food production struggles to keep pace with the increasing number of people. Moreover, political interests often exacerbate environmental issues, particularly in regions with significant disparities in the availability of resources such as jobs, managed agricultural ecosystems, and essential goods like food. This can lead to environmental degradation through processes such as erosion and desertification. Additionally, water pollution from human and industrial waste further compounds environmental challenges. The exploitation of natural resources also contributes to environmental degradation, as ecosystems suffer from the effects of deforestation, overfishing, and other unsustainable practices. These environmental issues pose significant threats to biodiversity, human health, and the overall well-being of the planet. Addressing these challenges requires concerted efforts at local, national, and global levels to implement sustainable practices, promote conservation efforts, and mitigate the impacts of human activities on the environment. By prioritizing environmental stewardship and adopting policies that prioritize conservation and sustainability, we can work towards safeguarding the health and resilience of ecosystems for future generations.

Air pollution is a significant consequence of human energy consumption for both personal and industrial purposes. Activities such as burning fossil fuels for transportation, electricity generation, and industrial production release pollutants into the atmosphere, contributing to poor air quality and adverse health effects. Furthermore, human activities can lead to extinctions by disrupting natural ecosystems. Practices such as strip mining, oil spills, and groundwater mining can result in habitat destruction, loss of biodiversity, and the displacement or extinction of plant and animal species. The impact of urbanization on a country's resources is influenced by several factors, including the availability of land and natural resources, the size of the population, and the level of resource consumption driven by technological advancements. This relationship is often expressed using the equation $I=P\times A\times T$, where I represents the impact, P represents the population, A represents affluence (or consumption per capita), and T represents the damage caused by technology. As the population of a country increases, there is greater demand placed on its resources. Some countries may be endowed with abundant natural resources, such as fertile agricultural land, energy resources, or mineral deposits, while others may be resource-poor. The balance between population size, affluence, and the environmental impact of technology plays a crucial role in determining the sustainability of resource use and the overall ecological footprint of a country. Therefore, it is essential to consider these factors in urban planning and resource management strategies to promote sustainable development and minimize negative environmental impacts.

The capacity of countries to sustain high populations varies significantly, as noted by Eldon & Bradley (2008). Factors such as urbanization and environmental hazards, coupled with limited local management resources in developing nations, often hinder their ability to effectively mitigate the risks associated with climate change within their jurisdictions. While many local governments can take measures to reduce risks, such as managing water distribution, controlling disease vectors, improving construction standards, organizing transportation systems, and addressing pollution and occupational health and safety concerns, the mitigation of climate change hazards in low- and middle-income countries requires broader societal changes. This includes significant shifts in lifestyles and consumption patterns, particularly among middle- and upper-income groups, the majority of whom reside in high-income nations. Addressing climate change effectively necessitates collective action on a global scale, with high-income nations playing a crucial role in supporting and collaborating with developing countries to build resilience and adapt to changing environmental conditions. This may involve providing financial assistance, technology transfer, capacity building, and other forms of support to enhance the resilience of vulnerable communities and promote sustainable development practices. Ultimately, mitigating the impacts of climate change requires concerted efforts from all sectors of society, including governments, businesses, civil society organizations, and individuals. By working together to address the root causes of climate change and build resilience to its impacts, we can create a more sustainable and equitable future for all.

Addressing adaptation in urban areas of low- and middle-income countries is crucial, as these countries host the majority of the world's urban population, most of the high-risk urban sites, and face significant challenges in adaptive capacity. It is projected that urban areas in low- and middle-income countries will also experience the majority of the world's population growth in the next two decades (United Nations, 2006). Climate change, freshwater scarcity, deforestation, and freshwater pollution are among the most pressing environmental challenges facing the world today. These issues are highly complex and interconnected, making it essential to examine them holistically. While our understanding of the interconnections between environmental problems has improved, there is still much we don't know about the extent of their interactions and the most effective strategies for addressing them. In Pakistan, urbanization and environmental problems have emerged as significant developmental issues. Addressing these challenges will require substantial investment and concerted efforts. By reducing urbanization and addressing environmental issues, Pakistan can experience a range of benefits, including improved health outcomes, increased productivity, and poverty alleviation. One key aspect of addressing these challenges is integrating land and water use planning to ensure food and water security. This involves developing sustainable agricultural

practices, promoting water conservation measures, and implementing policies to protect natural ecosystems and water resources.

Overall, tackling urbanization and environmental problems in Pakistan requires a comprehensive and collaborative approach involving government agencies, civil society organizations, businesses, and individuals. By working together to implement sustainable solutions, Pakistan can build a more resilient and prosperous future for its citizens while safeguarding its natural environment for future generations. The present study aims to investigate the impact of urbanization on the environment, focusing on a novel dimension that has been relatively underexplored in existing research. While numerous studies have examined the relationship between urbanization and environmental issues, many have focused on the influence of urbanization on achieving Millennium Development Goals (MDGs). In contrast, this paper defines urbanization as a primary driver of land use change, which in turn leads to various environmental problems. It acknowledges the abundance of literature detailing the environmental harms induced by urbanization, including air and water quality issues at the local level, as well as global concerns such as global warming and climate change. The study seeks to shed light on the immediate and visible impacts of urbanization on the natural environment, encompassing areas such as air pollution, water pollution, land pollution, noise pollution, deforestation, and climate change. By highlighting these direct effects, the research aims to provide valuable insights for policymakers seeking to address environmental pollution and achieve sustainable development goals.

Ultimately, the findings of this study can inform policymakers in developing new strategies and initiatives aimed at mitigating the adverse effects of urbanization on the environment. By taking proactive steps to reduce environmental pollution and promote sustainable urban development, policymakers can work towards achieving MDGs and fostering a healthier and more sustainable future for urban populations.

Indeed, this study holds the potential to contribute significantly to the formulation of appropriate strategies and policies pertaining to environment and urbanization. By examining the impact of urbanization on the environment and highlighting key environmental challenges associated with urban development, the research can inform policymakers and stakeholders in developing effective measures to address these issues. Furthermore, the findings of this study can serve as valuable resources for researchers, students, and individuals interested in this field. By providing a comprehensive overview of the current state of knowledge on the subject and offering insights into future research directions, the study can support further exploration and analysis of community characteristics and their implications for urban development and environmental sustainability. Moreover, this research represents a practical application of the knowledge acquired through academic studies at the university. By conducting empirical research and synthesizing existing literature, the researcher can demonstrate the application of theoretical concepts to real-world issues, thereby enhancing the relevance and impact of academic research. Finally, the study may become a valuable addition to university libraries and serve as a reference for future research endeavors in this area. By contributing to the body of knowledge on environment and urbanization, the research can inspire and inform future studies aimed at addressing the complex challenges of urban development and environmental sustainability.

2. METHODOLOGY

The present research utilized a qualitative and descriptive design to explore the relationship between urbanization and the environment, as well as to examine its effects on Millennium Development Goals (MDGs). Qualitative research methods were employed to gain a deeper understanding of the complex interplay between urbanization and environmental factors, focusing on descriptive analysis to characterize these relationships. Secondary data and information were collected from a variety of sources, including books, journals, magazines, published and unpublished dissertations, newspapers, and internet resources. Additionally, information was gathered from institutions and organizations specializing in urbanization and environmental studies. By leveraging secondary data sources, the research aimed to provide a comprehensive overview of the topic, drawing on existing knowledge and insights from previous studies and publications. Qualitative analysis techniques were employed to interpret and synthesize the information gathered, allowing for a nuanced exploration of the dynamics between urbanization, environmental degradation, and their implications for MDGs. The utilization of a qualitative and descriptive research design enabled the research to uncover rich insights into the complex relationship between urbanization and the environment, shedding light on the challenges and opportunities associated with sustainable urban development and environmental conservation.

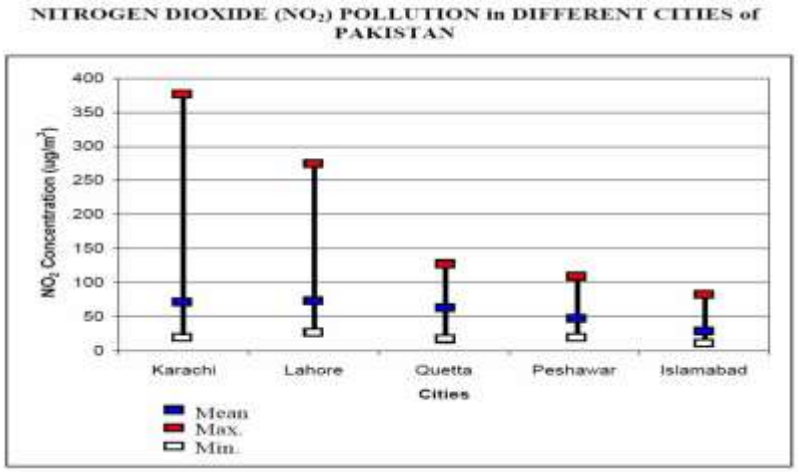
3. DATA ANALYSIS

In this study, a descriptive method was employed to analyze the secondary data and information collected from various sources. The data was presented using tables, maps, and diagrams where appropriate, facilitating a clear and organized presentation of the findings. After analyzing and interpreting the data, conclusions were drawn regarding the effect of urbanization on the achievement of Millennium Development Goals (MDGs). The study revealed that urbanization poses significant challenges to the attainment of MDGs due to its impact on the environment and socio-economic factors. Urbanization leads to increased pressure on natural resources, environmental degradation, and pollution, which can hinder progress towards MDGs related to environmental sustainability, such as ensuring access to clean water and sanitation, promoting sustainable cities and communities, and combating climate change. Furthermore, rapid urbanization can exacerbate socio-economic inequalities and disparities, affecting access to basic services, education, healthcare, and employment opportunities. This, in turn, can impede efforts to achieve MDGs related to poverty reduction, quality education, gender equality, and decent work and economic growth.

Urbanization, characterized by the physical expansion of urban areas, brings about various challenges and complexities. This transformation often leads to a shift from agricultural to industrial sectors, driving large-scale urban growth. As a result, urbanization emerges as a significant global issue with far-reaching implications. One notable aspect of urbanization is its rapid pace compared to overall population growth. Studies, such as the one conducted by Manzoor et al. in 2010, have shown that the rate of urban area expansion typically outpaces population growth by a considerable margin. This accelerated urban growth brings both opportunities and challenges, impacting various aspects of society, economy, and environment. One of the primary challenges associated with urbanization is the phenomenon of urban poverty. As urban areas expand, they attract migrants seeking employment opportunities and better living standards. However, the rapid influx of people often overwhelms urban infrastructure and services, leading to inadequate housing, sanitation, healthcare, and education facilities. This exacerbates poverty and socio-economic inequalities, particularly in informal settlements and marginalized communities within urban areas. Furthermore, urbanization contributes to environmental degradation through increased pollution, deforestation, habitat destruction, and depletion of natural resources. The concentration of industries, vehicles, and waste in urban centers results in air and water pollution, posing significant health risks to urban populations and ecosystems.

Addressing the challenges of urbanization requires comprehensive strategies and interventions aimed at promoting sustainable urban development. This involves improving urban planning and governance, enhancing infrastructure and service delivery, promoting inclusive economic growth, and fostering environmental sustainability. By adopting integrated approaches that prioritize the needs of all urban residents and minimize negative environmental impacts, cities can harness the potential of urbanization to drive inclusive and sustainable development. The rapid urbanization and industrialization in Pakistan have led to a significant increase in air pollution, emerging as a critical environmental issue (Qasim et al., 2013). The release of major air pollutants from diesel-powered vehicles, factories, and industries has worsened the quality of air, posing serious health risks to the population. Various air pollutants, including particulate matters (PM), volatile organic compounds (VOC), carbon monoxide (CO), nitrogen oxide (NO), sulfur oxide (SO), sulfur dioxide (SO2), lead, and other heavy metals, are being extensively emitted in major cities of Pakistan. These pollutants reach certain levels of concentration, contributing to the deterioration of air quality.

Recent surveys conducted using mobile units have revealed alarmingly high levels of suspended particulate matter (SPM) in major cities such as Lahore, Rawalpindi, and Karachi. Additionally, elevated concentrations of carbon monoxide (CO), nitrogen oxides (NOx), and sulfur dioxide (SO) have been detected in these urban areas. The presence of such high levels of air pollutants poses a significant environmental and public health concern, as every individual is exposed to the polluted atmosphere. Good air quality is essential for human health and well-being, and the current situation in Pakistan underscores the urgent need for effective measures to mitigate air pollution. Addressing air pollution requires comprehensive strategies and actions, including the implementation of stricter regulations on vehicle emissions, the adoption of cleaner technologies in industries, the promotion of public transportation and alternative fuels, and the establishment of green spaces and urban forests to improve air quality. By prioritizing environmental protection and public health, Pakistan can work towards ensuring cleaner and healthier air for its citizens. Nevertheless, this situation necessitates continuous monitoring, as the transport and energy sectors contribute nearly half of the nitrogen oxide (NO), two-thirds of carbon monoxide (CO), and about half of hydrocarbon emissions, as described by the World Bank (Qadir, 2002). These emissions primarily result from the burning of fossil fuels in transportation and power generation plants, which are essential for the country's development.



However, extraordinary attention should be paid to the sustainability of the ecological system and the escalating pollution levels, as unchecked air pollutants can severely impact public health. According to information from the Organization for Economic Cooperation and Development (OECD), pollution is projected to become a leading cause of premature death, potentially claiming the lives of 3.6 million people annually by 2050. Urban air pollution

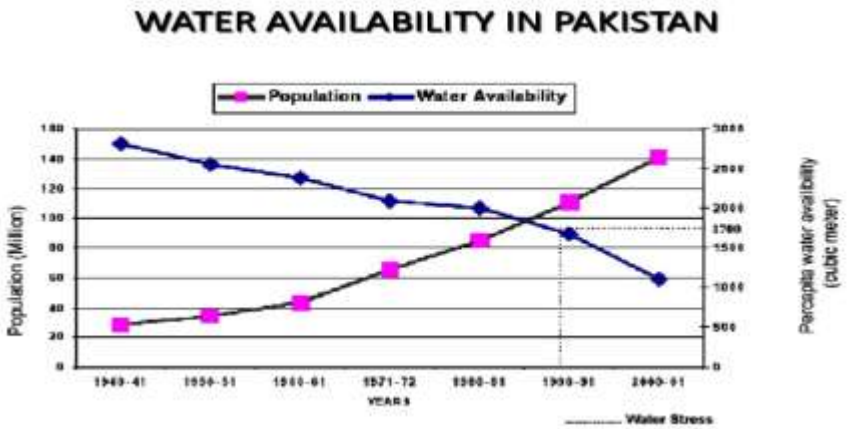
is poised to become the primary environmental cause of premature death in the coming decades, surpassing even such widespread killers as poor sanitation and waterborne diseases (Qadir, 2002). Efforts to mitigate air pollution must be intensified to safeguard public health and ensure sustainable development in Pakistan. This necessitates implementing stringent regulations, adopting cleaner technologies, promoting renewable energy sources, and fostering public awareness and participation in pollution control initiatives. By prioritizing environmental protection and health promotion, Pakistan can work towards creating a cleaner and healthier environment for its citizens now and in the future.

Measurement of NO2 concentration in different cities of Pakistan using diffusion samplers, such as Karachi, Islamabad, Peshawar, Lahore, and Quetta, has been conducted by Pak-EPA/JICA. This monitoring initiative aims to assess the levels of nitrogen dioxide (NO2), a harmful air pollutant, in various urban centers across the country. Meanwhile, pesticides, which are chemicals and biological substances used to manage pests such as insects, weeds, bacteria, and algae, are extensively utilized in both agricultural and urban settings. While pesticides are primarily applied in farmland, their usage in residential and commercial properties in urban areas is also significant. However, during storm events, runoff from residential and roadside areas can carry pesticides into local streams, posing risks to aquatic life and contaminating drinking water supplies. The results of the National Water-Quality Assessment (NAWQA) studies indicate that pesticides are widespread in streams and groundwater sampled within agricultural and urban areas throughout the nation. The most heavily used pesticide compounds are commonly detected, exhibiting geographic and seasonal patterns that align with the distribution of land use and associated pesticide application practices. These findings underscore the importance of monitoring and managing pesticide use to minimize environmental contamination and safeguard water quality. By implementing effective pollution prevention measures and adopting sustainable pest management practices, both in agricultural and urban contexts, adverse impacts on aquatic ecosystems and public health can be mitigated. Additionally, continued monitoring of air quality, such as the NO2 concentration measurements in urban areas, is essential for understanding and addressing the impacts of air pollution on human health and the environment.

The frequency of pesticide pollution is observed to be higher than expected, with individual pesticides rarely found in isolation. In fact, nearly every water and fish sample from streams, and about half of samples from wells with detected pesticides, contained two or more pesticide compounds (Howard Perlman, 2013). While the levels of individual pesticides in drinking water generally comply with current water-quality standards and guidelines set to protect human health, the cumulative impact on aquatic life and wildlife presents a significant concern. NAWQA results indicate that in many streams, particularly in urban areas, the presence of multiple pesticides frequently exceeds established water-quality guidelines, posing potential risks to aquatic ecosystems. To address this issue, prudent pesticide management practices are essential, especially in urban areas where pesticide contamination in drinking water is becoming increasingly prevalent. Effective pesticide management strategies include limiting pesticide application to only when necessary and following product label recommendations. Additionally, individuals applying pesticides should take care to avoid spreading the product onto pavements, gutters, curbs, and storm drains to prevent runoff and contamination of water bodies. The pressure on water resources in the country stems from various sources, including rapid urbanization, increased industrial activities, and the heavy reliance of the agricultural sector on chemicals and fertilizers. These factors have collectively contributed to water pollution, exacerbating the challenges associated with maintaining water quality and sustainability (Qasim et al., 2014). Addressing these issues requires comprehensive measures to minimize pollution sources, promote sustainable water management practices, and protect water resources for future generations.

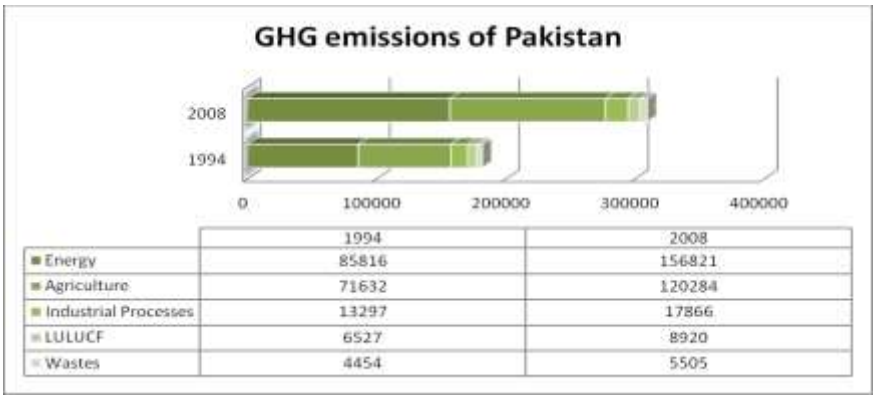
Agriculture is a significant contributor to water pollution while also playing a pivotal role in economic development. The primary causes of water pollution from agricultural activities include the use of pesticides, chemical fertilizers, intensive farming practices in certain regions, and the disposal of livestock waste, which can seep into groundwater or enter rivers and surface water bodies. This issue is prevalent in both developed and developing countries, particularly in regions experiencing rapid population growth. In response to the increasing demand for food, there is a tendency to apply large quantities of chemical fertilizers to enhance crop yields. However, these fertilizers contain harmful chemical substances that can contaminate sources of drinking water, posing risks to human health. The widespread use of fertilizers has the potential to elevate water pollution levels significantly. Furthermore, fertilizer plants are often associated with heavy pollution, making them traditional "dirty" sector industries. Despite these challenges, increased fertilizer consumption can lead to higher agricultural output, potentially driving economic growth (Rogers, 2000). This underscores the complex relationship between agricultural practices and economic development, where the careful management of fertilizers becomes essential not only for maximizing agricultural productivity but also for ensuring sustainable growth in the long term. Efforts to address water pollution from agriculture require implementing sustainable farming practices, reducing reliance on chemical fertilizers and pesticides, promoting organic farming methods, and adopting technologies for efficient waste management. By striking a balance between agricultural productivity and environmental conservation, countries can achieve economic development while safeguarding water resources and public health. On another front, freshwater resources are under serious threat from pollution and waste resulting from industrial exploitation and overpopulation (Amany & Daboor, 2009). The degradation of freshwater ecosystems not only jeopardizes biodiversity but also presents substantial challenges to human health and well-being. To tackle these pressing issues, a multifaceted approach is necessary. This approach should encompass effective regulatory measures to control pollution sources, implementation of sustainable management practices to minimize environmental impact, and public awareness

campaigns to promote responsible water use and conservation efforts. By addressing the root causes of freshwater pollution and adopting proactive measures to safeguard water resources, societies can mitigate the adverse effects on ecosystems and human health while ensuring the sustainable utilization of this vital resource.



Noise pollution poses a significant environmental challenge in many urbanized and industrialized towns, with industrialization having a direct impact on the natural ecosystem. Among the detrimental effects of industrialization, noise pollution stands out alongside air, water, and soil contamination. The health hazards associated with noise pollution are diverse and can affect individuals physically, psychologically, and socially. This study aims to shed light on various aspects of urbanization and industrial pollution, focusing particularly on the estimation of noise pollution levels. By assessing noise levels in residential areas, noise generated by vehicles, and community noise, the research provides valuable insights into the extent of noise pollution in urbanized and industrialized cities. The findings reveal that noise levels recorded from various sources often exceed acceptable limits, posing health risks to the public. The increased density of traffic in these areas contributes to heightened noise pressures, exacerbating the impact on human health and well-being. To address this issue, effective measures are needed to mitigate noise pollution, including stricter regulations on noise emissions, soundproofing measures for residential and commercial buildings, and public awareness campaigns to promote responsible behavior. By tackling noise pollution, urban areas can create healthier and more livable environments for their residents, enhancing overall quality of life (Basavaraj et al., 2013).

Industrialization, urbanization, and modern civilization are significant contributors to noise pollution in Pakistan, with vehicular traffic being the primary source, particularly in large cities. Vehicles such as cars, buses, motorcycles, trucks, and rickshaws, along with their exhaust and horns, generate high-intensity noise levels that disrupt the peace and tranquility of society. Even seemingly quieter modes of transportation, such as trains, can produce noise levels as high as 120 decibels (dB), which surpass the threshold of 85 dB beyond which human ears become sensitive to sound. This excessive noise not only affects individuals on the roads but also disturbs neighboring communities. Noise pollution poses various health hazards, as identified by medical professionals. Prolonged exposure to high levels of noise can damage the eardrums, leading to hearing problems. Additionally, it can contribute to conditions such as hypertension, high blood pressure, pain, and stress. To address this issue, concerted efforts are required from both the government and citizens. Measures such as the prohibition of unnecessary horn usage and the promotion of roadside plantation can help mitigate noise pollution. Trees, in particular, serve as effective noise absorbers and can significantly reduce noise levels in urban areas. Individuals also play a crucial role in combating noise pollution by adopting responsible behaviors and practices. By collectively taking action to reduce noise pollution, society can create a healthier and more peaceful environment for all its members.



	1994	2008
Energy	85816	156821
Agriculture	71632	120284
Industrial Processes	13297	17866
LULUCF	6527	8920
Wastes	4454	5505

In Pakistan, demographic shifts indicate a rapid pace of urbanization, with the average annual rate of urbanization increasing by 4% since 1951. Projections suggest that by the year 2030, a significant portion of Pakistan's

population, approximately 45.6%, will reside in urban areas, with more than 12 cities accommodating over one million people each. The urban population, which stood at nearly 43 million during the 1998 Census, has grown substantially, reaching 63.1 million by the year 2010. By 2030, it is anticipated to surpass 121 million. This level of urbanization, expected to reach 45.6%, would be among the highest in South East Asian countries. However, the challenges associated with urban development in Pakistan are formidable. The current trajectory of development leans more towards maladaptation rather than effectively addressing the diverse requirements, especially in the context of climate change. There is growing concern that efforts to address climate change are insufficient (Farhan, 2018). This highlights the urgent need for strategic urban planning and sustainable development practices to ensure that Pakistan's urban areas are resilient to the impacts of climate change and capable of providing a high quality of life for their residents.

Forest and agricultural lands represent crucial resources in Pakistan, yet they are increasingly under threat from degradation over time. The loss of forest cover, especially on steep slopes, not only accelerates surface erosion but also raises the risk of landslides and surface runoff. Deforestation has far-reaching consequences, including increased sedimentation in rivers, leading to elevated riverbeds and heightened flood risks in low-lying areas. Moreover, it adversely affects aquatic habitats and deteriorates water quality. Population growth exacerbates these challenges, driving urbanization and the conversion of agricultural and forest lands into developed areas. This transformation of land use patterns underscores the importance of comprehensive information on the spatial and temporal distribution of land use and land cover. Such data are essential for effective land management and planning, particularly in developing countries like Pakistan. Monitoring changes in land use and land cover provides valuable insights for planning development activities, including initiatives aimed at meeting community needs and promoting sustainable watershed management. By understanding patterns of land use change, policymakers and stakeholders can make informed decisions to safeguard these vital resources for future generations (IUCN, 2005).

Urbanization can indeed heighten the vulnerability of soils to various types of contamination, with urban soils in Pakistan increasingly affected by pollutants such as polycyclic aromatic hydrocarbons (PAHs). This rise in contamination could be attributed to the proliferation of petrol pump stations and mechanical workshops, necessitating ongoing monitoring efforts to assess and mitigate environmental risks. However, Pakistan's limited financial resources pose challenges to implementing comprehensive waste disposal systems. As a result, much of the household waste and other types of refuse are often indiscriminately discarded on vacant plots near residential areas and subsequently incinerated. This practice poses health risks to nearby residents, as burning waste can release harmful pollutants into the air. Moreover, the lack of adequate waste management infrastructure means that only a small fraction of waste, less than 5%, is recycled, while the majority is disposed of directly on the ground. The scarcity of trash cans along roads further exacerbates the problem, forcing residents living farther away to find alternative dumping sites. This improper disposal of waste attracts pests like flies, increasing the risk of disease transmission. Furthermore, the long-term consequences of land pollution are alarming, as the degradation of soil and accumulation of waste can persist for centuries, gradually eroding the natural environment. Given the already precarious state of Pakistan's ecosystems, the escalation of land pollution poses a significant threat to environmental sustainability (Mahmood, 2008).

The removal of solid waste presents significant challenges, as improper disposal methods can result in ground pollution, water pollution, and air pollution. In urban areas, the failure to effectively collect and remove waste from streets and public areas poses serious environmental and public health threats. Blocked drainage systems, caused by indiscriminate dumping of waste, further exacerbate these challenges, leading to contamination of water bodies near unregulated disposal sites. In Pakistan, the generation of solid waste ranges from 0.283 to 0.612 kg per capita per day, with a waste growth rate of 2.4% per year. Solid household waste is typically dumped on low-lying land, which could otherwise be utilized for more beneficial purposes. This indiscriminate disposal not only results in the loss of potentially valuable recyclable materials but also contributes to the degradation of land and surrounding ecosystems (Environment Protection Department, 2012).

To address these issues, comprehensive waste management strategies are urgently needed. This includes the establishment of efficient waste collection and disposal systems, as well as public awareness campaigns to promote responsible waste disposal practices. By properly managing solid waste, Pakistan can mitigate environmental pollution, protect public health, and harness the potential of recyclable materials for sustainable development.

4. CONCLUSIONS

Our health is profoundly influenced by the environment in which we reside. Numerous factors, such as poor air quality, pose significant risks to our well-being. Whether it's the air we breathe in our homes, workplaces, outdoor spaces, or during transportation, the quality of the air can have profound effects on our health. Exposure to pollutants in the air, such as particulate matter, nitrogen dioxide, sulfur dioxide, and volatile organic compounds, can lead to a range of adverse health outcomes. These include respiratory problems such as asthma, bronchitis, and chronic obstructive pulmonary disease (COPD), as well as cardiovascular issues like heart attacks and strokes. Prolonged exposure to air pollution has also been linked to an increased risk of lung cancer and other serious illnesses. Furthermore, poor air quality can exacerbate existing health conditions and disproportionately affect vulnerable populations, including children, the elderly, and individuals with pre-existing respiratory or cardiovascular conditions. Addressing air pollution and improving air quality is therefore essential for safeguarding public health and enhancing overall well-being. Indeed, besides air pollution, there are significant hazards associated

with unsafe water, poor sanitation, and hygiene practices. Access to clean and safe water is essential for maintaining health and preventing waterborne diseases such as cholera, dysentery, and typhoid fever. However, in many urban areas, inadequate sanitation infrastructure and poor hygiene practices contribute to water contamination and the spread of infectious diseases. Furthermore, poor sanitation and hygiene can lead to environmental pollution, as untreated sewage and wastewater are often discharged directly into water bodies, contaminating drinking water sources and posing health risks to communities. The challenges posed by environmental problems due to urbanization are widespread and affect regions, nations, and communities globally. Given the scale and complexity of these challenges, no region, nation, or community can isolate itself from their impacts. Addressing environmental issues such as air and water pollution, inadequate sanitation, and poor hygiene requires coordinated efforts at local, national, and international levels to implement effective policies and interventions aimed at promoting sustainable development and protecting public health. Addressing the global challenge of environmental problems, particularly those caused by greenhouse gas emissions such as carbon dioxide, nitrous oxide, methane, and halocarbons, necessitates comprehensive global frameworks that foster international collaboration and commitment. Given the interconnected nature of environmental issues and their far-reaching impacts, cooperation among nations is essential to develop and implement effective strategies for mitigating climate change, reducing pollution, and protecting natural ecosystems. International agreements such as the Paris Agreement provide a framework for countries to set emission reduction targets, share knowledge and resources, and work together to address common environmental challenges. Furthermore, international collaboration is crucial for promoting sustainable development practices, fostering innovation in clean technologies, and supporting vulnerable communities that are disproportionately affected by environmental degradation and climate change. By fostering worldwide alliances and commitments, we can collectively address the root causes of environmental problems and work towards building a more sustainable and resilient future for all.

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