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FARMLAND TO URBAN LANDSCAPE: THE THREAT OF ILLEGAL HOUSING SOCIETIES TO AGRICULTURAL LAND AND CLIMATE STABILITY IN PUNJAB - PAKISTAN

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ABSTRACT

This paper aims to examine the escalating issues of illegal housing societies in Punjab - Pakistan and their harmful impacts on climate stability and agricultural land use. This trend represents a serious danger to agricultural lands and climate stability because large number of agricultural lands are being turned into urban developments. The study emphasizes the lack of effective regulatory framework that has allowed un-registered societies to proliferate. The research further evaluates the regulatory deficiencies of the District's Development Authorities in tackling these illegal activities and demonstrates the dramatic discrepancy between registered and unregistered housing societies through a combination of quantitative data analysis of five major districts of Punjab – Pakistan. This research promotes comprehensive policy reforms and strengthened enforcement mechanisms to conserve agricultural land and support sustainable urban growth, as the effects of unmanaged land conversion become more apparent. The results highlight the critical need for integrated land use planning that balances environmental preservation and urban growth to ensure future generations' climate resilience.

Keywords: *Illegal societies, agricultural land, human security, climate stability, sustainable urban growth, land-use planning.*

INTRODUCTION

Agriculture is the mainstay of Pakistan's economy. It accounts for 23% of the GDP and together with agro-based products fetches 80% of the country's total export earnings. More than 42.3% of the labor force is engaged in this sector. The most populated province of Punjab provides the largest share in national agricultural production. Agriculture offers 19% of the GDP and gives employment to 48% of the population. It contributes in provision of raw materials to major industries; textile, leather, rice processing, edible oil, sugar and various food processing industries. Pakistan's total export has a three fourth share of agriculture and 60% of this share comes from Punjab. Over years, Punjab has tried to meet the challenges of food security.

Punjab becomes the second largest province making 25.9% of the country's total land, with its area of 20.63 million hectares. Land utilization status is accessible for 86% of the aggregate territory; while 14% land stays unreported. Another 14% of the area is not available for agriculture due to either being totally fertile or being occupied by infrastructure consequently only 72% of the land is available for cropping. 10.81 million hectares (53%) is a net sown area; an area that is cultivated at least once and year. 9% of the land is categorized as current fallow; an area that is not used for cultivation during a year. 8% land is marked as culturable waste which means an area that is not cultivated for more than three years and is a part of cultivated area.

Census of agriculture shows that there were 5,249,800 agriculture farms in Punjab, these farms consist majorly of very small farms. 42% of the farms are even less than one hector. Farms ranging from one hectare to 10 hectares make up half of the total number of farms and they occupy 68.9 % of the total area. Farms consisting of 10 hectares and above are 22.2% of the total farm area.

Punjab's total cropped area was 16.68 million hectares; this depicts those 5.87 million hectares was sown more than once during the year. In last year, wheat was cropped in 40% of the land similarly cotton occupies 11.5% and rice 12.8% the Punjab's total cropped area.

To fulfill the needs of the livestock population of the province, fodder was cropped in 11% of the, following Maize and Sugarcane occupying 4.2 % and 4.8% area respectively. Oilseeds, pulses and vegetables were cropped only in 12% of the area. The mission is to

sustain food security and support the national economy, making agriculture cost effective and knowledge based, with emphasis on farmer's welfare and maintenance of the yield potentials. (Pakistan Economic Survey 2022-2023).

The rapid and un-regulated extension of urban areas is increasing further challenges for Agricultural Lands and Climate Stability particularly in the agriculturally rich province of Punjab – Pakistan. Over recent years, the proliferation of illegal housing societies has not only disrupted land-use patterns but has also led to significant environmental and socio-economic consequences. These unregulated developments are encroaching upon vast tracts of fertile agricultural land, threatening food security, diminishing climate stability and exacerbating the adverse impacts of climate change (Choden & Ghaley, 2021).

Punjab, often referred to as the breadbasket of Pakistan, relies heavily on its agricultural output for both domestic consumption and exports. However, the transformation of arable land into concrete jungles is undermining its role as a cornerstone of national food security. This phenomenon is compounded by a lack of stringent regulatory oversight, with unregistered housing societies mushrooming across the province. District Development Authorities, tasked with monitoring and regulating such activities, have struggled to address this growing crisis effectively (Teoh et al., 2018).

This paper explores the multifaceted challenges posed by illegal housing societies in Punjab. Through a combination of quantitative data analysis and policy evaluation, it highlights the stark discrepancies between registered and unregistered developments. Furthermore, it underscores the urgent need for comprehensive policy reforms and enhanced enforcement mechanisms to conserve agricultural land and promote sustainable urban growth.

As the effects of unmanaged land conversion continue to manifest ranging from diminished crop yields to increase urban flooding and heatwaves it becomes imperative to adopt integrated land-use planning. Such an approach must balance environmental preservation and urban development to ensure climate resilience and sustainable livelihoods for future generations. By shedding light on this pressing issue, the study aims to catalyze informed

discourse and actionable solutions to mitigate the threats posed by unregulated urban expansion in Punjab.

PROBLEM STATEMENT

The rapid and un-regulated extension of urban areas is increasing further challenges for Agricultural Lands and Climate Stability particularly in the agriculturally rich province of Punjab – Pakistan. Over recent years, the proliferation of illegal housing societies has not only disrupted land-use patterns but has also led to significant environmental and socio-economic consequences. These unregulated developments are encroaching upon vast tracts of fertile agricultural land, threatening food security, diminishing climate stability and exacerbating the adverse impacts of climate change.

Despite their critical mandate, the District Development Authorities have failed to curb the proliferation of unregistered housing societies, largely due to weak regulatory frameworks and insufficient enforcement mechanisms. This lack of oversight has allowed illegal developments to thrive unchecked, leading to the irreversible transformation of arable land into urban concrete jungles. The resultant environmental and socio-economic consequences threaten not only local sustainability but also the broader goals of national food security and climate resilience.

Given the alarming rate of land conversion and its cascading effects on agriculture, environment, and human security, there is an urgent need for a comprehensive and enforceable policy framework. This framework must integrate sustainable land-use planning and robust regulatory enforcement to address the growing crisis. Without immediate intervention, the unchecked proliferation of illegal housing societies will continue to jeopardize Punjab's agricultural heritage, climate stability, and the livelihoods of future generations.

SIGNIFICANCE OF THE STUDY

This study highlights the critical consequences of illegal housing societies in Punjab, Pakistan, on agricultural land, climate stability and food security. It emphasizes the urgency of preserving Punjab's role as the country's agricultural backbone by addressing unregulated urban expansion. By providing a detailed analysis of regulatory deficiencies and their socio-environmental impacts, the research contributes to the discourse on sustainable urban growth and integrated land-use planning. The findings aim to guide

policymakers in implementing comprehensive reforms to balance environmental preservation and urban development, ensuring climate resilience and food security for future generations.

RESEARCH QUESTIONS

How do illegal housing societies in Punjab – Pakistan impact agricultural land use and climate stability?

How regulatory and policy measures can effectively address these challenges to ensure sustainable urban growth and environmental preservation?

LITERATURE REVIEW

The rapid urbanization in Pakistan is leading to significant conversion of agricultural land into housing societies and urban settlements, posing a threat to food security and sustainable farming practices. Studies in various cities, including Bahawalpur, Faisalabad, and Khairpur, have shown alarming rates of farmland loss to urban expansion (Amjad Ali Maitlo, 2023). Growth in urban population is the progressive transformation and deliberation of population in urban unit. It refers to the explosive increase in the percentage of total population living in the urban centers Population (Riley, 2004). The process of urbanization starts expanding in the developing countries in the end of 20th century (Pannell, 2003). Urbanization is generating problems with every passing day and creating an alarming situation in 1900 only 15 percent of world population was urbanite, but in 20th century it changes the map of world by rapid urbanization in 1950 causing industrial revolution. After sixty years approximately 50% of the world population is living in the urban areas (Li and Yeh, 2004) Urbanization is considered as a key for the development and modernization of a country (Fan, 2005). Although the urbanized world has grown faster than the less urbanized world, urbanization has now become the major issue for the basic problems such as social and environmental issues which are being faced in mega cities of the world (Lavely, 2001). Due to urbanization, the world is facing severe environmental problems mainly at local scales in form microclimatic changes and is contributing in global warming directly and indirectly (Karl & Trenberth, 2003). Urban areas have become the center of pollution as a result of congested and dense traffic (Liu and Diamond, 2005). Pakistan is a country where majority of the population is based and where the largest industries are ensconced (Shirmeen et al., 2007). Pakistan is urbanizing at an

annual rate of 3%, the fastest pace in South Asia (Mahsud-Dornan, 2007). Metropolitan cities are facing rapid urbanization as the population of Karachi alone has raised 80 % from 2000-2010, the biggest rise of any municipality in the world (Kotkin & Cox, 2013).

The United Nations Population Division estimates that, by 2025, nearly half the country's population will be living in cities as compared to one third of the population at present (Feeney & Alam, 2004). Other estimates which use density-centered rather than administrative / governmental classifications of urbanization and take into account "peri-urban" regions that lie separate from official urban boundaries – state that the urban population has already reached 50%. Pakistan is at the threshold of a major demographic transition (Zakria & Muhammad, 2009). Various attempts have been made so far to address the rising issue of urbanization or urban saturation in Pakistan (Malik & Wahid, 2014).

Pakistan is one of the main leading urbanizing countries of world with the fastest urbanization in south Asia. The annual growth of urbanization in Pakistan is more than 3% with the expanding mega cities, urban centers and city areas (Mustafa and Sawas, 2013). The phenomenal increase in urbanization in Pakistan may be attributed to two major causes which include natural growth in population and internal migration/relocation According to the current statistics Pakistan's total population is rising 3 percent every year and if the trend continues it will increase from 180 million today to 380 million people by 2050 (Arif & Hamid, 2009).

While considerable literature exists on urbanization and its socio-economic and environmental consequences globally, there remains a lack of focused studies on the specific issue of illegal housing societies in Punjab, Pakistan. These unregulated developments have unique implications for agricultural land conversion and climate stability. Existing research tends to generalize urbanization challenges without delving deeply into the regulatory and enforcement shortcomings specific to Punjab's context.

Additionally, most studies addressing urbanization in Pakistan primarily emphasize urban sprawl and population growth. They rarely explore the nuanced relationship between illegal housing societies, regulatory failures, and their cascading impacts on agricultural sustainability and climate resilience. Quantitative analyses of the discrepancies between registered and unregistered

housing societies, as well as the resultant socio-environmental consequences, are notably absent.

MATERIAL AND METHODS

Study Area:

This study investigates the major five districts of Punjab that have been influenced greatly by urbanization in the past few years. The province has a dense network of roads and constantly expanding infrastructure that makes the region suitable for this research. Compared to past records, most of the agricultural lands in the cities have been converted into a built-up area for new infrastructure as the cities expands. The following data show the land used in approved, illegal and under process Housing Societies in major five districts of Punjab – Pakistan.

Figure 1. Map Province of Punjab highlighting five major districts of study area.

Data Collection:

Districts	Land used in approved Housing Societies (in Kanals)	Land used in Illegal Housing Societies (In Kanals)	Land used in under-Process Housing Societies (in Kanals)
Lahore	262862.23	63981.8	118928.35
Faisalabad	51138.64	19639.74	56970.33
Rawalpindi	150490.31	27251.32	45527.18

Gujranwala	42894.91	16694.55	34010.26
Multan	33004	19810.37	23452.86

Table 1. Land used in approved, Illegal and under process Housing Societies in five major cities of Punjab – Pakistan (Source: Housing Societies in Punjab - https://ahs.punjab.gov.pk/?lang=ur).

Lahore		**Rawalpindi**		**Faisalabad**		**Gujranwala**		**Multan**	
2024	2000	2024	2000	2024	2000	2024	2000	2024	2000
14.5 M	5.7 M	2.4	1.4	3.8	3.4	2.4	0.109	2.205	1.251

Table 2. Population Growth of major districts of Punjab (Source: https://www.citypopulation.de/en/pakistan/punjab/admin/).

ANALYSIS OF DATA

After the selection of a suitable study area, the next task is the collection of relevant data and is crucial for the investigation. For that purpose, we need to analyze the availability of different resources in the area that has been targeted by urbanization and its impact on the agricultural lands and climate stability. For primary data, Field observations were conducted across five major districts of Punjab: Lahore, Rawalpindi, Faisalabad, Gujranwala and Multan. These districts were selected due to their significant agricultural landscapes as well as their rapid urbanization driven by the proliferation of illegal housing societies. The following observations highlight the impacts of urban encroachment on agricultural land and the associated environmental implications.

Lahore

In Lahore, the field observations revealed extensive urban sprawl characterized by the establishment of illegal housing societies on previously fertile agricultural land. Notably, areas such as DHA and Bahria Town have seen significant encroachment, leading to the fragmentation of agricultural parcels. Farmers reported losses of productive land and diminishing agricultural yield due to the encroachment and increased competition for water resources. Environmental concerns, such as soil erosion and loss of biodiversity, were prevalent due to the conversion of green fields into residential blocks.

Rawalpindi

In Rawalpindi, the observation revealed significant encroachment on agricultural land, particularly in peri-urban areas. Many housing projects were noted to be developed without proper zoning, leading to chaotic urban growth. The community expressed concern over losing their traditional farming practices, with many younger generations moving to urban areas for better opportunities. Observations also indicated inadequate infrastructure to support the rapid population increases, leading to challenges in waste management and environmental degradation.

Faisalabad

Faisalabad, known for its agricultural output, exhibited alarming trends of urbanization. Field observations showed that illegal housing schemes have emerged adjacent to key agricultural zones, including cotton and wheat fields. This proximity puts additional pressure on water resources, as unauthorized extraction for residential use diminishes viable irrigation for crops. Feedback from local farmers emphasized that urban encroachment has not only displaced them but has also increased input costs as they compete for dwindling resources.

Gujranwala

Field observations in Gujranwala illustrated similar patterns of illegal housing societies threatening agricultural fields. The conversion of land for housing has led to significant soil degradation, as construction activities disturb the natural landscape. Local farmers described the detrimental impacts on local agriculture, such as reduced crop rotation and loss of soil nutrients. Additionally, there is a noticeable increase in pollution levels associated with urban and industrial developments, further jeopardizing the health of the remaining agricultural land.

CONCLUSION OF FIELD OBSERVATIONS

Multan

Field visits in Multan highlighted the dramatic shift from agriculture to urban development in surrounding areas. Observations indicated that illegal housing projects are not only diminishing the quantity of arable land but also altering local microclimates. Farmers noted that the removal of vegetation has resulted in increased temperatures and changes in rainfall patterns, further threatening agricultural practices. Interviews with local farmers indicated a growing sense of anxiety over their livelihoods as urban expansion continues unabated.

The field observations across Lahore, Multan, Faisalabad, Rawalpindi, and Gujranwala collectively underscore the urgent need for policies that balance urban development with the preservation of agricultural land. The insights gathered reflect the multifaceted impacts of illegal housing societies, from economic insecurity for farmers to broader environmental concerns affecting climate stability. These observations will serve as a critical foundation for understanding the ongoing challenges and informing future recommendations aimed at sustainable land use in Punjab.

Secondary data include the collection of statistical data of land used in approved, illegal and under process housing societies and growing population in these five districts are a few of noteworthy sources for secondary data collected during this investigation. All the primary and secondary data was recorded digitally to avoid mixing and loss of data.

Data Analysis:

Analysis of data was done carefully through statistical data of approved, illegal and under process societies, population growth in five districts of Punjab and field observations. In which the "agricultural land and climate stability" was used as dependent variable and "threat of illegal housing societies" as independent variable. SPSS (Statistical Software for Social Sciences) was used to perform the regression analysis of the primary data. Analysis of secondary data includes the examination of impacts of urbanization on the agricultural land climate stability in the province of Punjab. Data shows that how urbanization is being increased without any regulatory framework and the land used in illegal and under process housing societies is more than to the approved housing societies which shows the ineffective regulatory framework of District Development Authorities.

RESULTS & DISCUSSIONS

The analysis of land use data and population growth trends in Punjab's five major districts—Lahore, Faisalabad, Rawalpindi, Gujranwala and Multan—reveals significant findings concerning urban expansion and its impact on agricultural land. Lahore exhibits the most extensive land consumption for housing societies, with 262,862.23 Kanals allocated to approved developments, 63,981.8 Kanals used illegally, and 118,928.35

Kanals under process. This correlates with the district's exponential population growth from 5.7 million in 2000 to 14.5 million in 2024. Faisalabad's agricultural lands are increasingly threatened, as 51,138.64 Kanals are allocated for approved housing, 19,639.74 Kanals are consumed illegally, and 56,970.33 Kanals are under process. The district's population grew modestly from 3.4 million in 2000 to 3.8 million in 2024. Approved housing societies in Rawalpindi occupy 150,490.31 Kanals, with illegal societies taking up 27,251.32 Kanals and 45,527.18 Kanals under process. The population increased from 1.4 million in 2000 to 2.4 million in 2024, driving urban expansion. In Gujranwala, 42,894.91 Kanals are used for approved housing, while illegal societies cover 16,694.55 Kanals and under-process developments total 34,010.26 Kanals. The population surged dramatically from 0.109 million in 2000 to 2.4 million in 2024. Multan's approved housing covers 33,004 Kanals, illegal developments occupy 19,810.37 Kanals, and under-process societies span 23,452.86 Kanals. Its population grew moderately from 1.251 million to 2.205 million over the same period.

The findings highlight the dual challenges of rapid urbanization and population growth in Punjab. Lahore's urban dominance is evident, with its high land consumption and population increase reflecting the strain on its infrastructure and agricultural resources. The spread of illegal housing societies across all districts underscores the inadequacy of enforcement mechanisms, exacerbating land-use inefficiencies and environmental degradation. Districts like Faisalabad and Gujranwala, which are critical for agriculture, face significant threats from land conversion. The loss of fertile land in these regions undermines food security and economic stability. Meanwhile, the under-process housing developments in all districts indicate that these trends are set to continue, further eroding the region's agricultural base. Population growth directly correlates with urban expansion, with dramatic surges in districts like Lahore and Gujranwala driving the demand for residential spaces. This growth intensifies the need for sustainable urban planning and stricter regulatory measures to protect agricultural lands and ensure balanced regional development. The environmental repercussions, including soil degradation, loss of biodiversity, and microclimatic changes, further underscore the urgency of addressing unregulated

urbanization. Effective urban policies, combined with community awareness and enforcement of land-use regulations, are crucial to mitigating the adverse effects of urban expansion on agricultural sustainability in Punjab.

CONCLUSION AND RECOMMENDATIONS

The study underscores the pressing need to address the unchecked urban expansion consuming Punjab's agricultural land. The disproportionate development of housing societies, particularly in Lahore and other rapidly urbanizing districts, reflects a lack of effective regulatory oversight and urban planning. This trend threatens food security, environmental stability, and the socio-economic balance of the region. To mitigate these challenges, the following recommendations are proposed:

Strengthen Land-Use Regulations: Authorities must enforce stricter land-use policies and crack down on illegal housing societies through consistent monitoring and penalties.

Promote Sustainable Urban Development: Implement urban planning strategies that prioritize vertical expansion and mixed-use developments to reduce the horizontal spread of cities.

Protect Agricultural Land: Designate and legally safeguard agricultural zones to prevent their conversion into residential or commercial areas.

Enhance Public Awareness: Educate communities about the environmental and socio-economic impacts of urban sprawl and the importance of preserving agricultural land.

Adopt Smart Growth Principles: Encourage compact, transit-oriented, and resource-efficient urban designs to accommodate population growth without compromising agricultural resources.

Invest in Rural Development: Reduce migration pressures by enhancing economic opportunities, infrastructure, and services in rural areas.

Utilize Technology for Monitoring: Deploy satellite imagery and GIS tools to track and manage land-use changes effectively.

Implementing these recommendations requires coordinated efforts from government agencies, urban planners, civil society, and local communities. Addressing these issues proactively will help ensure balanced regional development, safeguard agricultural resources, and promote long-term sustainability in Punjab.

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