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Peri-Urbanization in Populous Developing Asian Countries: A Systematic Review

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ABSTRACT

Peri-urbanization in developing countries is a double-edged sword. It creates many economic opportunities but disrupts peri-urban livelihoods. Through a systematic literature review, we present a comprehensive overview of peri-urbanization and livelihood dynamics in China, India, and Indonesia. Data shows that physical urban development is outpacing population growth, leading to increased livelihood assets and outcomes but also disruptions. The rapid urban expansion increased peri-urban livelihood assets, leading to increased income and well-being for off-farm workers, while farmers faced landlessness, water degradation, and migrant competition. The findings encourage regional scientists and professionals collaboration with the government on peri-urban planning to develop a common framework for sustainable peri-urban livelihoods that anticipates spatial-demographic changes and livelihood pattern dynamics to identify and address future challenges.

1. INTRODUCTION

The term peri-urbanization refers to fragmented urbanization in the area around urban settings [1]. This process is due to the urban population moving to the city's hinterland areas for better living situations or caused by the rural people moving to peri-urban areas to earn a living [2, 3]. Peri-urbanization is defined by the rapid growth of population and physical development in the towns and suburbs areas between urban and rural landscapes [4, 5]. A significant portion of the city's expansion occurs in the rural areas surrounding them [6, 7]. The uninterrupted expansion of the city has reduced rural characteristics and created peri-urban spaces, most prominently in the Asian developing world. The focus on China, India, and Indonesia is tenable due to their status as the most densely populated countries in Asia, representing two-thirds of the continent's population, and these countries encompass the primary regions of East Asia, Southeast Asia, and South Asia [7]. These three developing Asian countries are currently undergoing peri-urbanization, a process that involves significant societal implications.

Mancebo [8] identifies housing preference, location selection for specific activities, and planning biases as the three major peri-urbanization drivers. Low housing costs and law fluidity in land use planning in the peri-urban areas, along with rising property prices in urban areas accelerate these drivers. Mancebo [8] also asserted that the hinterland is more hedonistic because it is safer, more tranquil, and closer to nature than the urban core. The fast-growing urban population [9], the declining housing situation [10] and the lack of urban services [11] further contribute to the acceleration of peri-urbanization. Other scientists discovered that peri-urban land is less expensive than the inner-city and big towns [12, 13]. Moreover, Webster [14] underlines peri-urban landowners' economic rationality as a critical driver of peri-urbanization. Landowners would prefer non-agricultural land uses with higher potential cash earnings since there are more financial benefits of converting cropland to urban land uses [15]. This motive compels several traditional landowners to change their land-use approaches to generate "sellable" areas for urban physical development [16] The above-unmonitored circumstances directly impact peri-urban development and sustainability.

Another factor contributing to peri-urbanization is a lack of land-use plan enforcement, city expansion limitations, and regional planning in many cities in developing countries. Individual landowner actions would not effectively protect ecosystems without the strict enforcement of land-use plans [17]. This state of affairs is widely linked to institutional weakness, political interference, and residents' attitudes toward land policy [18, 19] Consequently, numerous metropolitan areas in developing countries encounter disorganized physical development, including the incursion of vast open spaces and the uncontrolled transformation of primary farmlands to non-agricultural uses.

It is undeniable that peri-urbanization benefits the surrounding area's development. On a brighter note, Korah et al. [20] noticed that peri-urbanization had increased the availability of quality residential properties and enhanced access to essential social facilities and amenities, including power supply, medical facilities, roadways, clean water supplies, and education in the surrounding area. According to

them, the loss of farmland due to rapid urbanization has developed new household capacities, including artisanal (woodwork, pipework, and metalwork) and business skills. Even though certain peri-urban residents prospered from physical development by utilizing the numerous employment options, others were negatively impacted by job losses. However, some households were harmed by the loss of their farmland, which resulted in occupational displacement [21, 22]. Thus, when the concepts of well-being and asset conservation are considered, it is apparent that these residents have forfeited the capacity for adapting to their potential livelihoods.

For the most part of the world, peri-urbanization is primarily a spatial phenomenon in rural areas adjacent to rapidly growing metropolitan areas [7, 23]. This process has accelerated the village area's transformation into a more urban environment on physical, social, and economic levels. Rapid peri-urbanization is characterized by massive development, transition, and urban sprawl into their peripheries, ultimately driving vast peri-urban growth, especially in developing countries [24, 25]. Despite its numerous benefits, peri-urbanization has disrupted the harmony of both agricultural and non-agricultural landscapes by transforming rural land use, resulting in deplorable degradation. Thus, peri-urbanization is an unpreventable process that results in the transition of livelihoods and resource spaces, leading to the creation of peri-urban areas.

Peri-urbanization has become Asia's most significant land management challenge [3, 26, 27]. Asian peri-urbanization emphasizes on land, and most of the urban extension spaces of Asian cities are densely populated rural hinterlands [28]. Land monetization, fictitious commodity issues, and their transformation are known as peri-urbanization [29-31]. Numerous regular processes work in these transition spaces, including livelihood shifts, asset utilization, and the renewal of the physical settings.

Through this systematic review, we aimed to depict a rich picture of peri-urbanization emergence in China, India and Indonesia, including a critical analysis of livelihood changes and dynamics. The systematic review initiated with the selection of peri-urbanization-related articles from reputable scientific journal databases using specific inclusion and exclusion criteria. Inclusion criteria were applied to urban and rural Asian scientific papers and excluded non-English peer-reviewed papers beyond social sciences, humanities, and regional development fields. We identified the essential aspects related to emerging peri-urban landscape change. and provided a comprehensive view to advance an assessment of livelihood changes and dynamics in the face of rapid peri-urbanization. Our findings bring practitioners' attention on the driving forces and processes of peri-urbanization in Asian developing countries and on appeal to national and regional policy agenda for investment in research and development of new forms of sustainable livelihood systems for 'integrated development' in peri-urban areas.

2. METHODOLOGY

The study applied a systematic review method. Systematic reviews play a crucial role in enhancing knowledge and providing scientific communities with a comprehensive understanding of the current state of knowledge regarding peri-urbanization and its impacts on livelihoods in developing Asian countries. These reviews serve as valuable resources for informing policymaking and guiding practical initiatives in the field. The review process involved three main steps: search and selection procedures, analysis of data, and results outlining [32].

2.1 Search and selection procedure

The peri-urbanization papers were explored to review the academic papers on peri-urban livelihood changes and dynamics, particularly in Asia's top three most populous developing countries. Science Direct, Wiley, Springer, Taylor & Francis, Sage, and the Directory of Open Access Journals (DOAJ) are six scientific bibliographic databases selected with a defined set of three keyword types, as listed in Table 1.

Table 1. Keywords used to identify relevant literature

Date	Database	Search Query		
25 January 2023 **26 January 2023** **27 January 2023** **28 January 2023** **29 January 2023** **30 January 2023**	Science Direct Wiley Springer Taylor & Francis Sage DOAJ	peri-urbanization	AND "livelihood" "peri-urban" "rural-urban" "Asian developing countries" "Global South" "China" "India" "Indonesia"	AND peri-urban "growth" "development" "transformation" **"**expansion" "urban sprawl" livelihood "changes" "dynamics" "transition"

The search results revealed numerous sources on peri-urbanization and peri-urban livelihoods literature from various academic fields, particularly the social, humanities, psychology, environmental, regional and development, and applied sciences. Therefore, not all sources can be considered for this investigation, as the literature must contain essential concepts and ideas [33]. Setting inclusion and exclusion criteria in a systematic review is essential for providing clear and well-documented procedure [34].

At an early stage, we applied the inclusion criterion for urban and rural scientific papers focusing in Asian countries. At the same time, the exclusion criteria were applied to non-English peer-reviewed papers beyond the fields of social sciences, humanities, and regional development. On this basis, 1009 urban and rural studies were initially identified using relevant keywords. The paper selection was employed from January 1990 to January 2023. In the second phase, sources that lacked a precise and clear conceptual approach were

excluded. Consequently, 480 duplicate sources were eliminated, and 529 sources, based on scientific papers, advanced to the later phases. In phase three, the research design and relevant concepts from 529 sources were analyzed to eliminate potentially irrelevant sources. During this phase, 249 articles with unclear methodological procedures were eliminated from the selection process, and another 176 records were excluded after a full-text screening. At last, 104 papers were selected for final review after completing three screening phases, as shown in Figure 1.

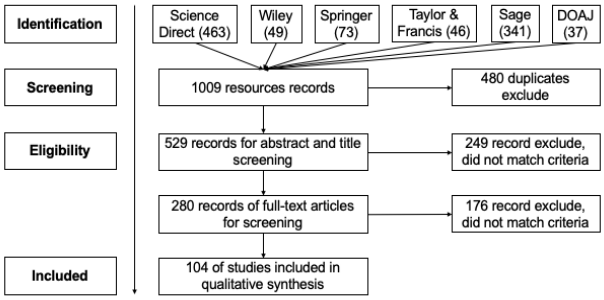

Figure 1. Process of the systematic review

A thorough analysis of 104 selected sources on a peri-urbanization study revealed that each paper had discussed the expansion of peri-urban areas and the drivers and livelihoods dynamics in peri-urban settings using various methodological and approach analyses.

2.2 Data analysis

Using the content analysis method based on an inductive approach, we analyzed the text of 104 selected papers by considering the two dimensions of peri-urbanization drivers and peri-urban livelihood changes and dynamics. Content analysis is a qualitative method that thoroughly examines the textual data in a document [35]. This qualitative method explicitly extracts categories from the data text [36]. Paragraphs in the body text of the paper are selected as the analysis unit. The examination of paragraphs in the dimensions mentioned earlier consists of four stages. In the initial stages, we extract the codes from the paragraphs as the analysis unit and convert them into a sentence in the code class. In the next stage, we grouped these codes based on similarities and differences in the new class as subcategories. In the third stage, the extracted subcategories are grouped into a larger class based on their specificity. In this instance, the previously listed categories are not utilized; instead, categories are typically extracted from text data. In the final stage, intersecting data categories are grouped into broader-scoped class of themes. Moreover, we applied the Sustainable Livelihood Approach (SLA) framework [37] to guide the content analysis. The SLA framework is a reliable approach to evaluating the dynamics of peri-urban livelihoods. This framework intends to promote structured and concise discussions with diverse perspectives regarding the changes in livelihood assets, strategies, and outcomes.

2.3 Result reporting

A total of 50 codes were divided into two themes: peri-urbanization driving forces and peri-urban livelihood changes and dynamics, including five categories of physical and non-physical factors of peri-urbanization, and livelihood assets, strategies, and outcomes. At this level, intersecting codes are eliminated and grouped into 19 subcategories. Next, these subcategories are compared, and the subcategories that overlap are organized into larger groups within the category class. Similarly, the intersecting categories are merged into two main themes encompassing the extracted relevant data. The content analysis method discovered groups of themes, categories, subcategories, and codes corresponding to peri-urbanization literature. This analysis will improve our understanding of the peri-urbanization of the investigated studies and their correlation to the result's validity and effectiveness.

Based on the systematic literature review, the result and discussion section were classified and analyzed in the following thematic categories: peri-urban landscape change and its drivers, and livelihood change and dynamics due to peri-urbanization.

3. RESULTS AND DISCUSSION

3.1 How rapid is peri-urban landscape change in Asian developing countries?

The way that section titles and other headings are displayed in peri-urbanization refers to transforming a hinterland area from mainly rural to predominantly urban. Peri-urbanization is not only about physical transformation but also about massive social, economic and cultural transition in the city's hinterland area. As developing countries, Asian society is in the midst of this urban expansion process. Peri-urbanization rates in the three most populous Asian countries-China, India, and Indonesia - have risen from less than 20% in the 1970s to around 33% in India and approximately 50% in China and Indonesia in 2010.

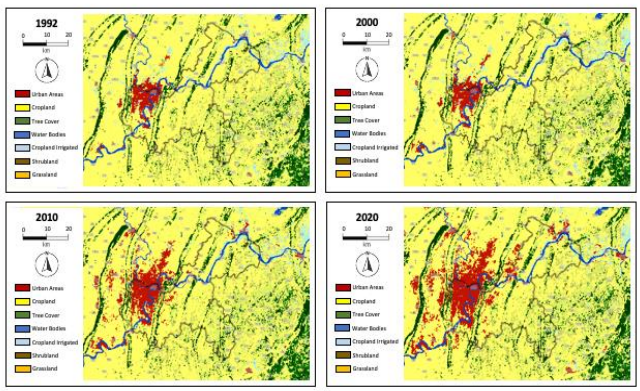

Figure 2. LULC changes in Chongqing, China (modified from http://maps.elie.ucl.ac.be)

Figure 2 shows that China's most populous city, Chongqing, has a dramatic rise in its built-up area, from 15,028 ha in 2000 to 83,041 ha in 2020. The continuous rapid urban sprawl in the peri-urban area has transformed the bare land into a built-up area. In the last few decades, China, one of the largest global developing countries, has seen intense peri-urbanization [38, 39]. The 'Opening up' policy in 1987, the emergence of the 'Socialist Market Economy' in 1992 [40, 41], the implementation of economic return land and rural industrialization [42-44], and the combination of

decentralization, fiscal reform (marketization) and globalization [45] gave a powerful impetus to this process. Moreover, rapid economic and industrial development [46], increased urban resident relocation [42], accessibility to urban infrastructure, and proximity to a river have contributed to peri-urbanization in China.

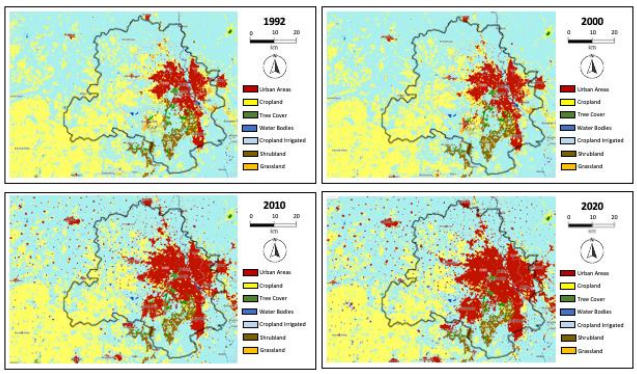

Figure 3. LULC Changes in Delhi, India (modified from http://maps.elie.ucl.ac.be)

Next, Figure 3 shows that India's most metropolitan area, Delhi, experienced rapid peri-urbanization. The city is expanding toward its periphery by transforming rural areas into urban developments. The built-up area in Delhi has expanded by 71% over the last two decades, at an average per year of 1,566.52 ha. The rural region comprising agricultural fields in Delhi's southwest and northwest regions experienced the most significant loss (13,195 ha). Meanwhile, the south and south-western regions expanded their plantation class by 10 ha during peri-urbanization. In Delhi's southern region, scrub and forest classes predominate, whereas the eastern regions of Delhi, with the highest population density, have a minor forest area. The forest fragmentation in southern Delhi has been exacerbated by urban sprawl, with a per-year decline of 322 ha. The peri-urban area has expanded with the addition of plantations, and the exposed area has steadily transformed into a built-up area [47]. Most of this growth came from peri-urban agricultural land, exposed areas, scrublands, forests, and water bodies. Several areas in Delhi's outer zone have been classified as built-up areas between 1992 and 2020 [47-51]. Moreover, peri-urbanization has been emerging in India's peri-urban area due to the influence of the development of a highway, the establishment of the IT industry, and the promotion of secondary education [49, 50, 52]. India's peri-urbanization was sped up by the Industrial Revolution in the 1970s and 1990s, followed by globalization in the 2000s [53-55].

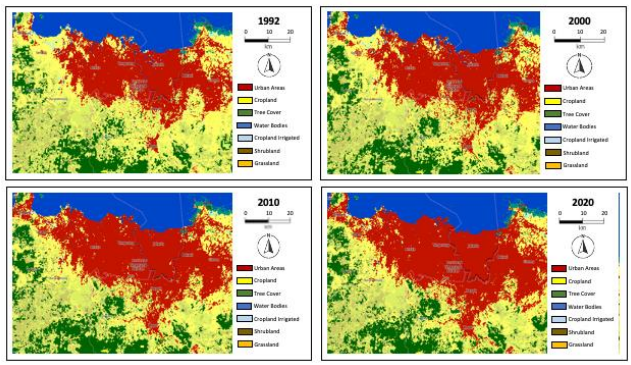

Figure 4. LULC Changes in Jakarta, Indonesia (modified from http://maps.elie.ucl.ac.be)

A recent rural-to-urban transition study in Indonesia has implemented multitemporal land use/land cover (LULC) data to examine farmland loss and physical urban extension in the city's hinterland area. Figure 4 shows Jakarta, the largest city in Indonesia, experienced a fast urban land use expansion into the peri-urban areas. Between 1992 and 2020, the built-up area increased by 29,213 ha (21.56%). In contrast, the vegetation decreased by 21,636 ha (8.51%), and dry/fallow land decreased by 14,489 ha (5.78%). The most considerable shrinkage of vegetation occurred between 2000 and 2010 and affected 90,986 ha. The change shows that most new cities are in Tangerang Regency (western Jakarta). Meanwhile, Bekasi City transformation (eastern Jakarta) follows the highways [56-58]. Urban expansion in both metropolitan areas continued into the peri-urban areas, consistently forming two major mega-urban corridors in Jakarta. This peri-urban growth pattern is parallel with the peri-urbanization pushed by the urban infrastructure development [26, 59-62], as well as the growth of private settlements, new towns, and private industrial estate [56, 57, 63].

The peri-urbanization process in Asian developing countries involves various driving forces, as listed in Table 2.

Table 2. The peri-urbanization driving forces

Theme	Categories	Sub-Categories	Codes	Description	Authors
Peri-urbanization driving forces	Physical factors	Physical development	The development of a highway road	A major public road designed to accommodate high-speed vehicular traffic between cities, regions, or important destinations	[49, 56, 57]
			The emergence of private settlements	A standalone residential structure where one family or household resides	[56, 57]
			New town development	The expansion of a residential area that creates a city	[56, 57]
			Private industrial estate development	An area developed specifically for industrial and commercial activities.	[46, 56, 57]
			The development of urban infrastructure	The physical and organizational structures, facilities, and systems that support the functioning of cities and urban areas	[26, 50, 59, 62]
			The development of IT industry	A rapid evolving sector that includes information and technology system creation and management.	[49, 64]

			Promotion of secondary education	The educational stage that prepares students for higher education, vocational training, or entry into the workforce.	[49, 52, 65]
		Accessibility status	Accessibility to a water body	The distance of an area from large water bodies such as seas, lakes, rivers, ponds, and reservoirs.	[66-69]
			Accessibility to urban infrastructure	The distance of an area from urban facilities such as transportation, housing, communication healthcare and education.	[46, 49, 62, 70]
			Industrial revolution	A significant shift from agrarian, handcraft-based economies to industrialized and mechanized.	[47, 52, 71]
			Economic globalization	Cross-border trade, investment, communication, and the flow of goods, services, and information have increased global economic integration.	[45, 71, 72]
		Economic aspects	Massive inflows of Foreign Direct Investments	The investment made by individuals, businesses, or governments from one country into assets or ownership stakes in another country.	[40, 43, 60]
			The emergence of market economy	An economic system where supply and demand in the open market determine production, distribution, and pricing.	[40, 73, 74]
			Socioeconomic status	Social and economic status, measured by income, education, occupation, and wealth.	[52, 75]
			City rapid economic growth	The expansion and development of economic activities within a city area	[46, 71]
			Establishment of new economic activities	A growing industry, sector, or economic activity due to technology, consumer preferences, market trends, or other factors.	[50, 62]
Non-physical factors			Increasing urban population	The number of people living in urban areas within a specific geographical region	[46, 52]
		Population dimension	Migration from rural area	The movement of people from rural areas to urban areas	[47, 48-51]
			The internal (rural) population growth	The increase of people living in rural or countryside areas over a certain period of time.	[49, 76]
			Economic opening up policy	A reform implemented by a country to liberalize its economy and increase its engagement with the global system.	[40, 41, 45]
			Relocation of urban resident	The process of moving people from densely populated urban areas to other locations	[42, 77]
			Economic return land	Utilized or developed land that produces economic returns or financial benefits.	[42, 78, 79]
		Policy practices	Rural industrialization	The process of establishing and developing industrial activities, such as manufacturing, processing, and production, in rural areas	[42, 43, 80]
			Decentralization	The transfer of power, decision-making, and responsibilities from a higher level to local	[45, 81]
			Fiscal reform (marketization)	The process of making changes to a country's fiscal (tax and expenditure) policies and systems to achieve specific economic objectives	[45, 82-84]

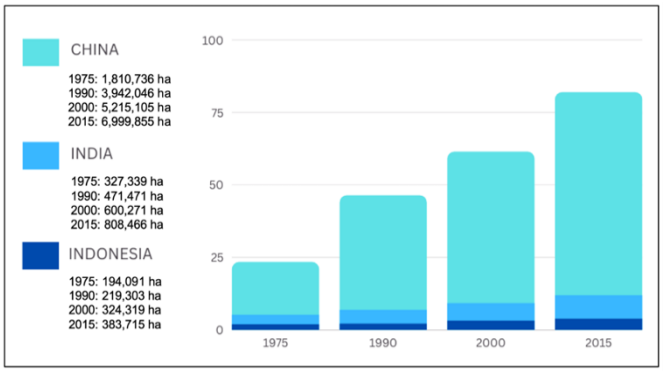

Figure 5. The peri-urban built-up area growth in Asian developing countries (mofified from GHSL [84])

Urban expansion is the primary driver of peri-urbanization. In term of physical factors, the development of highways [49, 56, 57] enhances the accessibility to urban infrastructure. Thus, peri-urbanization easily sprawling in the urban periphery. Moreover, the emergence of the market economy [40, 73, 74] increases migrant population [47-51] and decentralization policy [45] accelerate the urbanization of rural areas. All those essential forces advanced the process of peri-urbanization. In Asian developing countries, peri-urbanization occurs in tandem with the rapid growth of the built-up area.

Figure 5 illustrates that from 1975 to 2015, China, India, and Indonesia experienced tremendous physical peri-urban growth. The built-up area in China multiplied by 286,57% between 1975 and 1990, which was recorded as the most dramatic increase. Meanwhile, India increased by 146.98%, with the most significant increase occurring between 2000 and 2015. Indonesia attained 97.70%, with the most considerable growth between 1990 and 2000. Inevitably, China is the Asian developing country with the highest peri-urban growth rate in its built-up area, followed by India and Indonesia.

Peri-urbanization is a powerful force that rapidly transforms rural areas into more urbanized. Rapid peri-urbanization has transformed the open land in peri-urban areas, including bare land [40, 41], farmland, as well as wastelands, scrublands,

sandy areas, water bodies [47], and even forest [56], into a built-up area. Numerous essential driving forces have been identified by scholars as driving the rapid peri-urbanization of Asian developing countries, which is physical factors including physical development [26, 46, 49, 50, 56, 57, 59, 64] and accessibility status [46, 49], and the others are non-physical factors, including economic aspects [40, 41, 43, 45-47, 50, 59, 75], population dimension [46-51] and policy practices [40-43, 45, 80, 85].

Peri-urban areas often suffer from peri-urbanization pressure. Therefore, managing urban sprawl, developing multi-functional land-based activities, constructing public infrastructure, and enhancing community participation should be policy priorities for controlling urban expansion. Even though the drivers and impacts of peri-urbanization have been identified, a few issues still require further explanation. There is still a lack of information regarding which part of the peri-urban areas is transformed faster. Considering that peri-urban areas are gray areas, it is critical to assess the urban expansion level differences between peri-urban areas within the city boundaries and the village adjacent to the city. Specific spatial information on urban expansion can help classify the level of peri-urbanization in peri-urban areas.

As cities expand, their populations continue to multiply. Nonetheless, the towns and suburbs population of developing Asian countries has grown significantly. From 1975 to 2015, China, India, and Indonesia experienced tremendous peri-urban population growth (Figure 6).

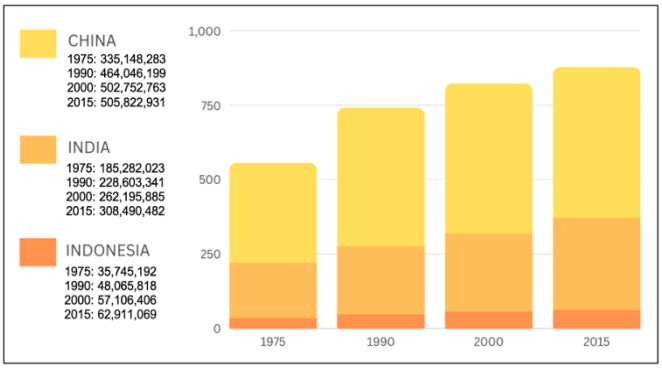

Figure 6. The peri-urban population growth in Asian developing countries (mofified from GHSL [84])

Figure 6 illustrates that China increased by 50,92% between 1975 and 1990, with the most dramatic increase occurring between 1975 and 1990. At the same time, India increased by 66.49%, with the most significant increase occurring between 2000 and 2015. Indonesia attained 75.99%, with the most considerable growth between 1975 and 1900. Surprisingly, Indonesia is the Asian developing country with the highest peri-urban growth rate in its population, followed by India and China. This phenomenon indicates that many rural areas have become more urban based on an increased population with urban characteristics.

Urban communities in Asia, which include their peri-urban areas, can enlarge as far as a hundred's kilometers beyond the city's administrative boundaries and yet are growing faster than the inner-city area [14]. The scholar emphasizes peri-urbanization as an essential aspect of an urban extension. The migration of people to peri-urban areas is the common denominator of peri-urban development. In Asian developing countries (China, India, and Indonesia), this migration is frequently prompted by motives such as low wages or a poor quality of life [48].

Peri-urban growth has pulled migrants to live in the peri-urban areas. Linked to the previous findings, the results of this review indicated that the rise in peri-urban population parallels the speed of peri-urbanization [84]. To mitigate social problems, a policy agenda that strictly controls the number of migrants entering a peri-urban area is required. Migrants are considered the most significant factor in peri-urban population growth [46-49, 51]. Nonetheless, it is unclear which migrants enter peri-urban areas the most and what their primary objectives are. Further research is required to analyze the demographic change between locals and non-locals in peri-urban areas, including population size, composition, and population density. Detailed population statistics made it easier to implement the policy.

Peri-urbanization in Asia is faster than in other developing countries and is expected to account for 56 to 64 percent of peri-urban growth by 2050 [86].

Urban expansion is a global phenomenon that drives peri-urbanization, and the majority is concentrated in Asia. China, India, and India, the world's three most populous countries, are the most predominant. Furthermore, urban expansion has implications for transformation in numerous peri-urban dimensions, particularly the peri-urban livelihood dynamics.

3.2 How dynamic are peri-urban livelihoods changing in ASIA developing countries?

When rural areas become urbanized, peri-urban households can access a wide range of working opportunities, both agricultural and non-agricultural based. This option enables peri-urban residents to elevate their incomes by participating in various livelihood activities since having shared their assets and resources. Due to the rural-urban transition, peri-urban residents are already changing their livelihoods, in some cases shifting away from natural resource exploitation toward increased reliance on urban employment and services. These dynamics involve changes in livelihood assets, strategies, and outcomes, as listed in Table 3.

Table 3. The dynamic of peri-urban livelihood changes

Theme	Categories	Sub-Categories	Codes	Description	Citation
Peri-urban livelihood changes and dynamics	Livelihood assets	Natural capital	Increased the value of land ownership	Legal control over land or real property by a person, group, or company	[86-88]
			Increased the value of natural resources	Renewable and non-renewable natural materials used by humans for various purposes	[89-92]
		Physical capital	Small-scale industries are expanded	A business with a relatively modest amount of capital whose workforce is comprised primarily of locals or relatives.	[53, 93]
			Housing facilities are expanded	A variety of features, services, and amenities that a house or residential property offers to its residents.	[53, 66]

	Financial capital	Increased financial services and investment	A modern economics enables individuals, businesses, and governments to manage money, assets, and financial activities.	[78, 94]
		Increased loan	A common way for individuals or businesses to raise funds for asset purchases, investments, and cash flow management.	[94, 95]
	Human capital	Improved education level	The process of acquiring knowledge through various teaching	[96, 97]
		Improved skill	The process of obtaining specialization through various training	[96, 97]
		Improved health	A condition of complete physical, mental, and social health as opposed to merely the absence of disease or infirmity.	[96, 97]
	Social capital	Increased social connectivity	The degree to which individuals are connected and engaged with their social networks and communities	[98, 99]
		Increased social stratification	The hierarchical arrangement of individuals or groups in a society according to socioeconomic status	[62, 98]
Livelihood strategy	Agricultural-based strategies	From traditional crops to vegetable crops	Traditional crops are produced and consumed by communities for generations, often as the basis of their diets and cultures. Meanwhile, vegetable crops are plants that are cultivated for their edible leaves, stems, roots, flowers, and fruits.	[100-102]
		From monocrops to mixed cropping	Monocropping involves planting a single crop species over a large area of land. Meanwhile, mixed cropping involves growing multiple crop species simultaneously in the same field.	[53, 97, 103]
		From farmland to rental settlement	Farmland refers to agricultural land that is used for the cultivation of crops, raising livestock, or other agricultural activities. Meanwhile, a rental settlement is a legally binding contract between a landlord and a tenant that outlines the terms and conditions for renting a property.	[104, 105]
	Non-agricultural-strategies	From agricultural to industry	Agricultural refers to the practice of cultivating crops, raising livestock, and other activities related to the production of food. Meanwhile, industry refers to a sector of economic activity that involves the production and manufacturing of goods and services	[106, 107]
		From agricultural to off-farm employment	Agricultural refers to the practice of cultivating crops, raising livestock, and other activities related to the production of food. Meanwhile, off-farm employment refers to work opportunities that are pursued by individuals outside of their primary involvement in agricultural activities.	[106-108]
	Diversification	From single to multiple jobs	A single job is a job where a person performs specific tasks for one employer or organization. Meanwhile, multiple jobs refer to the practice of an individual holding more than one job simultaneously.	[53, 109]
	Migration	From cultivating land to migration	Cultivating land refers to the process of preparing, tilling, and managing the soil in order to grow crops or other plants. Meanwhile, migration refers to the movement of people from one place to another, often involving a change in their usual residence.	[48, 104, 109-111]
Livelihood outcomes	Income	Increased non-farm work income	Individual or household income from non-agricultural sources.	[104, 112-114]
	Well-being	Better amenities	The features, facilities, and services that a property offers to enhance the comfort, convenience, and overall quality of life for its residents (i.e., kitchen appliances, laundry facilities and outdoor spaces).	[104, 115, 116]
	Food security	Better agricultural products	The goods and materials that are produced through farming and other agricultural activities.	[97, 104]
	Vulnerability	Increased competition between farmer and non-farm	The dynamic relationship between agricultural (farming) and non-agricultural (non-farm) employment opportunities, as well as the choices made by individuals.	[107, 117, 118]
	Resources	Quality of water worsened	Water's chemical, physical, biological, and radiological characteristics determine its suitability for drinking, recreation, agriculture, industry, and aquatic ecosystems.	[49, 92, 97, 119]
		Quality of arable land worsened	Land that is suitable for crop cultivation and can be utilized for agricultural purposes.	[94, 119-121]

Peri-urbanization involves an increase in physical development and population in the peri-urban areas. These changes affect the type and quantity of assets used for livelihood. In terms of natural capital, a raise in the variety of land uses, and the growing number of land-related stakeholders impacted increased the price of land ownership and the value of natural resources in Kerala, India [89-92]. Furthermore, in terms of physical capital, there involves an increase in built areas, including the number and type of industries [53, 93] and settlements and their facilities, including roadways, markets, and private assets such as buildings, and other equipment in Delhi, India and Beijing, China [53, 66]. In addition, increased access to institutional credits also increases access to financial capital. According to Webster et al. [94] and Shatkin [78] peri-urbanization changed the financial capital of peri-urban in East Asia. They assert that per-urbanization increased extensive financial services and investments. The development of formal financial institutions also increased peri-urban dweller loans [94, 95]. In other words, peri-urban dwellers have access to a broader range of financial services that enable them to implement various livelihood opportunities.

Regarding human capital, Meikle et al. [96] noticed that the acquired livelihood skills have not been utilized optimally; for instance, woodwork, pipework, and metalwork were exploited to complement other livelihood portfolios. Sati et al. [97] noted that physical development in peri-urban areas enhances people's education and skill in Sichuan, China. According to her, the development of higher educational institutions is critical for educating and training peri-urban dwellers, as a result, the peri-urban community gains better knowledge and skills to earn a living. Moreover, the healthcare sector's development has improved people's health and capacity to engage in various livelihood activities [96, 97]. Concerning the changes in social capital, Mallik [98] indicated that social connectivity in peri-urban Kolkata, India, has changed. According to him, there has been an increase in reliance on institutional bodies and connecting social ties (bridging and connecting social capital), particularly among pure tenant households [98, 99]. Furthermore, it also increased social stratification, mainly based on economic status [98, 122].

Physical development in peri-urban areas also alters peri-urban communities' livelihood strategies. According to Abass et al. [122], peri-urban communities face various livelihood options due to the interaction of rural and urban systems. Following physical development in peri-urban areas, livelihood options that proliferate are non-agricultural activities [11, 106]. Furthermore, this massive physical development has resulted in peri-urban dwellers shifting their livelihoods from agricultural to rental settlement in India [87, 104, 107] or toward more productive economic activities such as industry [3, 123] or off-farm employment [106-108]. In other areas, though still based on agriculture, Fahmi & Iskandar [21] documented a shift in cultivated crops in peri-urban areas of Tanggerang, Indonesia, from traditional crops to vegetable farming. Others found that farming practices changed from mono-crops to mixed cropping in Indonesia and China [53, 97, 103] This shift in crop production occurs in response to market demand, primarily to meet the food preferences of urban migrants, which are quite distinct from those of local people [53, 97]. In other words, livelihood changes entail changing the nature of the activity and the livelihood's orientation to maximize benefits. Numerous studies also indicate that peri-urban residents in developing countries no longer rely on a single asset or resource to generate profit. They participate in various works to meet their basic needs, which are typically called multiple livelihood portfolios [13, 87, 88, 109]. Furthermore, another study reveals that when individuals are unable to stable a living in their home country, they are forced to migrate [48, 104, 109-111]. When people are unable to secure a livelihood, migration is one of the most effective strategies.

The outcome of myriad livelihood strategies demonstrates how peri-urban residents can effectively utilize both capital assets and access to advance their living conditions. Three distinct livelihood outcomes were possible as a result of the livelihood strategies: whether improved, deteriorated, or remained unchanged [87]. The outcome's nature would influence future livelihood strategies. Changes in livelihood outcomes depend on the number of resources available to a household. Farmers who successfully intensified crop production or incorporated mixed crops increased their productivity could improve their income [104, 112-114]; well-being with better amenities [104, 115] and food security with better agricultural products [97, 104]. Likewise, skilled peri-urban dwellers who work in non-agricultural sectors or hardworking migrants multiplied their livelihood outcomes. However, a livelihood strategy's failure is quantified by a negative outcome. These unsuccessful livelihood strategy changes, combined with an increased cost of living, were noted to have harmed peri-urban dweller's living conditions [117] including increased social competition between local and non-local [107, 117, 118] and exacerbated water [49, 92, 97, 119] and land quality [97, 119-121]. The benefits of peri-urbanization are expected to accrue to livelihood strategies with positive outcomes.

Peri-urbanization altered the type and quality of livelihood assets of peri-urban residents. Primarily, it increased natural and physical capital value [89-91], financial quantity [124], human quality [96, 97], and social reliance [87, 98]. These massive changes require holistic asset management. The government should refine the use of private and public resources to maintain ecosystem services in peri-urban areas. The current findings need to be followed by a discussion of which assets are changed the most and who exactly benefits from these changes. Future research must evaluate how significantly the asset has changed. Scientists would benefit from examining other parameters that could explain the transformation of numerous aspects of peri-urban livelihood assets. A specific set of explanatory parameters can help explain some natural capital changes (including changes in land ownership, leased land, and water discharge), physical capital (including the availability of machinery, transportation, and services), financial capital (the amount of savings and loans), human capital (including household size) and social capital (including social interaction, social networks, social bonds, and social organization). Leveraging specific parameters will elevate the discussion regarding livelihood asset changes.

Moreover, peri-urbanization generates a variety of occupations, where the majority of peri-urban dwellers tend to turn from agricultural to urban employment [104, 107]. Urban employment is viewed as more advantageous than agricultural work. Therefore, policies and programs should focus on strengthening community capacity. This agenda is required to balance origin, age, and ethnicity in work opportunities. A recent study found that peri-urban residents responded to peri-urbanization in various strategies, including agricultural-based

livelihoods [53, 97, 100], non-farm livelihoods [104, 106, 107], diversification [53, 109], and migration [48, 104, 109]. This review demonstrates that numerous authors have already described the structure and changes of the livelihood strategy. Nevertheless, there is room for further discussion. In order to be more comprehended, scientists would benefit from obtaining more information on the spatial-temporal dimension of changes in livelihood strategies. Chadi and Hetschko [125] discovered that individuals frequently change their livelihood strategy to improve their standard of living. Many of them were successful, whereas others struggled. After a certain failure, they return to their former job and make modifications, such as changing the technique, the equipment, or the product [126]. It has the potential to explain multiple facets of changes in peri-urban livelihood strategies, as well as the extent to which the strategy changed.

Furthermore, peri-urbanization advanced some peri-urban dweller's outcomes, particularly income of non-farm employment [104, 112, 114], well-being [104, 115, 116], and food security [97, 104]. On the other hand, social vulnerability, mainly competition between farmers and non-farmers in resource utilization [31, 107, 117] and environmental sustainability, both water resources [92, 97] and land quality [101, 123-125] had a detrimental impact. Since livelihood outcomes depend on the number of resources, the government needs to create a more sustainable multifunctional peri-urban landscape to preserve the resources and the environment. This dual side effect of peri-urbanization revealed disparate outcomes. Undeniably, peri-urbanization dynamics led to the creation of groups of losers and winners. Numerous studies have found that farmers [21, 22] and women [127, 128] are marginalized communities as a result of the peri-urbanization process. They are communities that have lost land and jobs and are at risk of losing their traditions and cultural identity due to land-use change and a dramatic rise in the migrant population. However, several studies have found the opposite. Laverack [129] and Schilling et al. [130] noted that in the working competition, migrants are more disadvantaged than locals due to unequal access, including language, religion, and ethnicity barriers. Furthermore, some economic conditions exclude migrants because they prioritize local workers [131].

Thus, it remains unclear who will benefit or suffer the most from the peri-urbanization process. Further in-depth analyses of the changes in peri-urban livelihood outcomes revealed that the literature could elaborate on the specific type of evaluable component, which would be helpful in performing a thorough investigation to comprehend the changes in peri-urban livelihood outcomes. For instance, income can be further evaluated from crop income, income from renting land, non-farm income, and remittance income. Well-being can be divided into physical health, mental health, a sense of direction and purpose, and belonging. In terms of food security, it can be monitored from its availability, accessibility, and nutrition. Vulnerability can be represented by the level of civil rights, liberties, status, and access to public services. Lastly, environmental sustainability can be analyzed using the efficiency of water use, solid waste management, and the practice of recycling and reusing a particular product. Using these integrated parameters could explain changes in livelihood concerning peri-urbanization and clarify how far the outcomes benefited the peri-urban dwellers and how vast it marginalized vulnerable peri-urban communities.

4. CONCLUSION

China, India, and Indonesia have experienced intense peri-urbanization due to their rapid urban expansion, which has been driven by private settlements, access to urban infrastructure, highway development, information technology, and secondary education, as well as economic and infrastructure development. This rapid peri-urbanization triggers a spatial transformation, causing a surge in migrants and massive population growth, and has a corresponding effect on livelihood systems. Increasing physical development and population in peri-urban areas affects the type and quantity of livelihood assets. This process has increased access to natural, physical, financial, and human capital. Financial services and investments are more accessible to peri-urban residents, and higher education and healthcare have improved human capital to increase knowledge and skills. It enables multiple livelihood portfolios of peri-urban communities, including agricultural, non-farm, diversification, and migration. This review identified a dynamic in peri-urban community livelihood changes: the extent of peri-urban communities' dependence on natural resource-based economic activities is assumed to play an essential role in determining their vulnerability level. As agricultural land is continuously shifted to create a space for urban expansion, the pressures of rapid peri-urban growth have changed the peri-urban community's livelihood, including assets, strategies, and outcomes. This review recommends that policymakers and practitioners develop a regional collaboration of robust and interlinked peri-urban sustainable livelihood strategies to cope with the rapid peri-urbanization process. Further research is required to assess the changing patterns of livelihood in peri-urban areas, particularly between local and non-locals and different socio-economic spectrums, using specific and integrated parameters to determine the winners and losers during the rural-urban transition.

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