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The development of suburban housing: Between needs and sustainability challenges

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Abstract

The development of suburban housing by developers continues to increase along with population growth and the need for affordable housing. This phenomenon provides economic opportunities but also poses serious challenges in the context of sustainable development. This study adopts a descriptive-qualitative research design, focusing on the case of Jakarta's suburban buffer zone to examine development patterns, spatial transformations, and emerging sustainability issues. This study analyzes how suburban housing development practices meet the principles of sustainable development, including environmental, social, and economic aspects. Previous research findings show that many developers focus on physical expansion without considering land conservation, water resource management, and efficient transportation connectivity. The impacts are fragmentation of natural habitats, increased carbon emissions, and reduced quality of life due to lack of public facilities and green open spaces. However, several innovative projects have begun to adopt the concept of green cities with a sustainable spatial approach, use of environmentally friendly materials, and integration of social infrastructure. The findings indicate that although some improvements have emerged, suburban housing development remains insufficiently aligned with sustainability principles, particularly in terms of transit integration, equitable access, and long-term environmental resilience. This study emphasizes the importance of government regulation, developer awareness, and community participation in encouraging more inclusive and sustainable housing development. With the right approach, suburban housing development can not only meet housing needs but also support environmental sustainability and long-term social welfare.

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PREFACE

The International Seminar on Livable Space (IS-LiVaS) is an ongoing academic seminar series. Organized by the Department of Architecture at the Faculty of Civil Engineering and Planning at Universitas Trisaki, it is held in collaboration with various academic and professional partners. Since its launch in 2012, the series has become a forum for scholarly discussion about livable space and the built environment. The first seminar took place on February 16–17, 2012, with the theme "Creating Space for a Better Life." Since then, the seminar has been a regular event, addressing new challenges related to livability, sustainability, and spatial development from multiple perspectives.

The fourth International Seminar on Livable Space (IS-LiVaS 2025) took place on August 8–9, 2025, at the Mercure Hotel in BSD City, Tangerang, Indonesia. IS-LiVaS 2025 embraced the theme “Regenerative Livable Built Environment,” emphasizing the need to advance livable space research beyond traditional sustainability methods and toward regenerative and integrative paradigms. The seminar featured keynote and invited speakers from academic institutions, professional practices, and government entities. Representatives from Monash University, Thammasat University, the University of Seoul, UCSI University, Universität Stuttgart, the University of New South Wales, and Swinburne University of Technology were present, as well as practitioners and policy stakeholders from Indonesia.

The articles included in these proceedings were chosen via a review process and are categorized into four subject areas: The Concept of Livable Space; Appearance and Shape of Livable Space; Various Dimensions of Livable Space; and Creation Procedure of Livable Space. These contributions include theoretical discussions, empirical findings, design-based studies, and applied research on the built environment. Contributors to this undertaking represent diverse academic fields, icluding architecture, civil engineering, urban and regional planning, landscape architecture, and environmental studies. Many investigations address the complexities inherent in tropical and rapidly changing urban settings while incorporating broader international perspectives.

As part of the IS-Livas seminar series, this publication aims to document current research trajectories and foster sustained academic dialogue and cooperation within the realm of livable and regenerative built environments. The editors extend their appreciation to the keynote and invited speakers, authors, reviewers, and organizing committee members for their invaluable contributions to IS-LiVaS 2025.

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IS LivaS
International Seminar on Livable Space

REGENERATIVE LIVABLE BUILT ENVIRONMENT
Seminar, Exhibition, and Excursion*

VENUE
Seminar and Exhibition : **Mercure Hotel, BSD City**
Jl. Edutown Cbd 55 Kavling Lot II No 8 Bsd City Pagedangan 15339 Tangerang City - Indonesia
Excursion : BSD City

IMPORTANT DATES
06 August 2025	Deadline for Registration & Abstracts Submission (batch-2)
07 August 2025	Deadline for Payment of Seminar and Excursion
08 August 2025	Seminar and Exhibition
09 August 2025	Excursion
18 August 2025	Deadline for Full Papers Submission (batch-2)

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(Vice Minister of Public Works)

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and all disciplines from various fields as well as stakeholders related with the creation of space such as Architecture, Civil Engineering, Urban Design, City Planning, Landscape, Environmental Engineering, Technology, Culture, Economics, Art and Design, Real Estate

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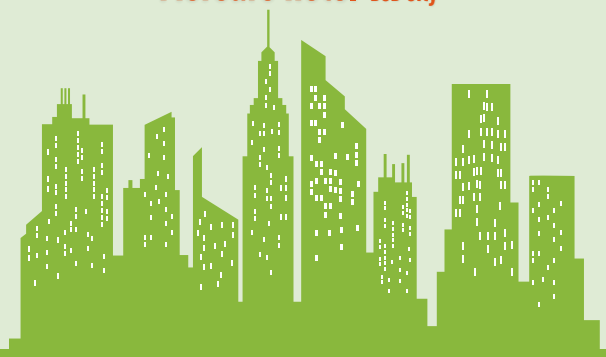

This seminar has been conducted twice before and will continue to be held every four years with similar topic and several themes related to current issues. Department of Civil Engineering and Department of Architecture, Faculty of Civil Engineering and Planning (FTSP), Universitas Trisakti is the organizer of this event in collaboration with some universities as Co-Host, which have the same main research approach as Universitas Trisakti.

BACKGROUND
Regenerative Livable Built Environment (RLBE) is a holistic approach to designing and managing human-made environments, focusing on regeneration, livability, and sustainability. It aims to enhance natural systems, foster inclusive and resilient communities, and minimize environmental impact through efficient resource use. RLBE requires an integrative design approach that considers social, ecological, economical, and technological factors.

Benefits of RLBE include improved air and water quality, enhanced biodiversity, increased community engagement, reduced waste and emissions, economic growth through sustainable practices, and improved public health. RLBE prioritizes the balance between human well-being, ecological health, and economical viability, shifting from traditional built environment practices.

The forum encourages stakeholders to rethink livable spaces, moving towards creating better environments for the prosperity of all living beings. This forum aims to build understanding and creative capacity to create livable spaces for humans and other living beings, while also serving as an initial step in establishing milestones for the study of livable space in educational and research institutions in Indonesia, by gathering ideas and experiences from diverse groups as a collective foundation to raise awareness of the importance of quality living environments for all.

TOPICS
The topic of this international seminar is Livable-Space with the theme "REGENERATIVE LIVABLE BUILT ENVIRONMENT". The sub themes will be chosen from the following areas:
- The Concept of Livable-space
- Appearance/Shape of Livable Space
- Various Dimensions of Livable-space
- Creation Process of Livable-space

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The development of suburban housing: Between needs and sustainability challenges

Mohammad Ischak[1], *Maria Immaculata Ririk* Winandari[2], *Inavonna* Inavonna[3], *Ardilla Jefri* Karista[3*], and *Sumiyarti* Sumiyarti[4]

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Abstract. The development of suburban housing by developers continues to increase along with population growth and the need for affordable housing. This phenomenon provides economic opportunities but also poses serious challenges in the context of sustainable development. This study adopts a descriptive–qualitative research design, focusing on the case of Jakarta's suburban buffer zone to examine development patterns, spatial transformations, and emerging sustainability issues. This study analyzes how suburban housing development practices meet the principles of sustainable development, including environmental, social, and economic aspects. Previous research findings show that many developers focus on physical expansion without considering land conservation, water resource management, and efficient transportation connectivity. The impacts are fragmentation of natural habitats, increased carbon emissions, and reduced quality of life due to lack of public facilities and green open spaces. However, several innovative projects have begun to adopt the concept of green cities with a sustainable spatial approach, use of environmentally friendly materials, and integration of social infrastructure. The findings indicate that although some improvements have emerged, suburban housing development remains insufficiently aligned with sustainability principles, particularly in terms of transit integration, equitable access, and long-term environmental resilience. This study emphasizes the importance of government regulation, developer awareness, and community participation in encouraging more inclusive and sustainable housing development. With the right approach, suburban housing development can not only meet housing needs but also support environmental sustainability and long-term social welfare.

1 Introduction

Until now, the issue of urbanization is still a dominant phenomenon that accompanies the growth of big cities in the world [1, 2]. Globally, urbanization has dramatically increased from 30% in 1950 to 55% in 2018, and is projected to rise to 68% by 2050. More developed

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regions are expected to have a higher proportion of their population living in urban areas by 2050, reaching 86.6%. Significant urban population growth is anticipated in India, China, and Nigeria, with these countries contributing 35% of the overall global increase between 2018 and 2050 (Figure 1). This global trend has intensified the demand for affordable housing and has triggered widespread suburban expansion to accommodate the rapid influx of population.

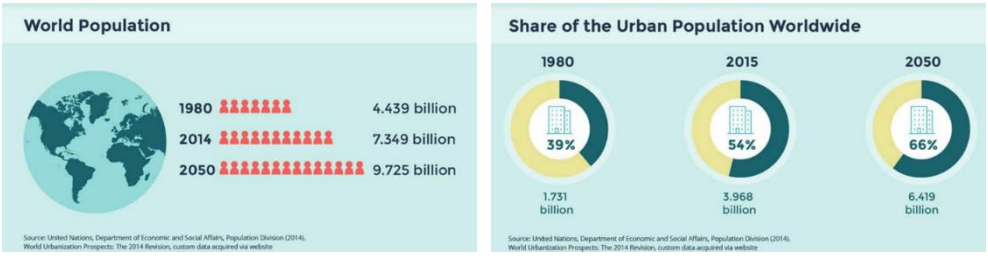

Fig. 1. The distribution of the world's population residing in rural and urban areas [3].

The Jakarta area as the nation's capital has experienced very high urbanization pressure in recent decades [4, 5]. The inability of the core area of Jakarta to accommodate population growth and housing needs has driven the expansion of housing to buffer areas known as the Bodetabek area (Bogor, Depok, Tangerang, and Bekasi). This phenomenon is known as suburbanization [6].

The buffer areas of Jakarta have been chosen as the main locations for housing provision due to lower land prices compared to the city center [7]. This indicates that the buffer areas have become the primary destination for new housing for workers seeking more affordable residential options outside the city center.

The following (Table 1 – Table 4) are the latest statistical data regarding the growth in the number of houses and the area of new housing land in the Jakarta buffer zone (Bogor, Depok, Tangerang, and Bekasi) during 2023-2024.

Table 1. Number of landed houses by region (2023–2024) [8].

Area	Total landed housing units	Demand units	Percentage of demand
Tangerang	211.064 unit	199.996 unit	94.7%
Bogor-Depok	88.637 unit	82.076 unit	92.6%
Bekasi	95.399 unit	92.811 unit	97.3%
Jakarta	26.345 unit	22.873 unit	86.8%

Table 2. Supply of new landed houses semester II 2023 [8].

Area	New supply percentage
Tangerang	65%
Bogor-Depok	14% (mix)
Bekasi	Data not available
Jakarta	Data not available

Table 3. Annual (YoY) landed home supply growth as of quartal 3 2024 [9].

Area	Supply growth (%)	Price growth (%)
Tangerang	14.4%	3.5%
Bekasi	7.0%	3.0%
Depok	4.2%	12.3%
Bogor	3.7%	4.3%
Jakarta	4.1%	5.2%

Table 4. Built-up housing land area and development potential [9].

Area	Built Up Area (ha)	Total Concession (ha)	Bilt up Percentage
Tangerang	6.482 ha	17.241 ha	37.6%
Bekasi	3.805 ha	13.340 ha	28.5%
Bogor-Depok	2.836 ha	19.208 ha	14.8%
Jakarta	593 ha	1.094 ha	54.2%

The development and expansion of housing in the areas around Jakarta as depicted in the tables can be linked to three studies. The first is the influence of the existence of new housing on the pre-existing environment, both physical and non-physical. Second, the relationship with the consequences of infrastructure in relation to the local city center and the city of Jakarta as a growth center. The third is the relationship with the shortage of housing supply (housing backlog) nationally.

However, the majority of existing scholarship has predominantly concentrated on the consequences of urbanization and metropolitan expansion, whereas comprehensive investigations into sustainability challenges, especially those examining the interrelations among land conversion, infrastructure disparities, environmental degradation, and socio-spatial inequality in suburban housing, remain limited.

There is a research gap in the limited integration of environmental, social, and infrastructural dimensions in suburban housing studies, particularly in rapidly growing regions such as Bodetabek. Previous research has yet to provide a holistic assessment of how suburban housing development aligns with sustainable development principles or how policy frameworks respond to emerging spatial challenges. The novelty of this study lies in its multi-dimensional assessment of suburban housing, combining perspectives of sustainability, spatial planning, and socio-economic dynamics, using Bodetabek as its case study.

1.1 Urgency of research

This research has high urgency, among other things because of data from related institutions (Central Statistics Agency, Housing and Settlements, Ministry of Public Works) and previous research results which show the following conditions:

1.1.1 Population growth and housing needs in Jakarta's buffer zone

The high population growth rate in Jakarta and its buffer zone has increased pressure on the availability of housing land. Without proper planning, the risk of slums and land use conflicts will increase.

1.1.2 Environmental damage and decrease in regional carrying capacity

The conversion of agricultural land and green open spaces into residential areas has a direct impact on environmental degradation, flood risk, and loss of local biodiversity.

1.1.3 Infrastructure and mobility disparities

Many housing areas in Bodetabek were built without adequate infrastructure support, especially public transportation. Dependence on private vehicles worsens congestion and increases carbon emissions, which is contrary to the goals of sustainable development.

1.1.4 Lack of integration in regional planning

Fragmentation in policies and planning between local governments in the Bodetabek area has resulted in unsynchronized development between regions, which complicates efforts to organize the region comprehensively.

Accordingly, this study aims to examine the extent to which suburban housing development practices in Jakarta's buffer zones conform to the principles of sustainable development, encompassing environmental, social, and economic dimensions.

By considering these contexts, this study is expected to provide academic and practical contributions in formulating a housing development approach in suburban areas that is oriented towards sustainability, especially in the buffer zones of Jakarta. The results of this study can be used as strategic input for city planners, housing developers, and policy makers at the local and national levels.

1.2 Research question

Based on the background that has been explained, the formulation of the problem in this study is as follows:
- How are the dynamics of housing development in the suburban areas of Bodetabek in responding to the housing needs of urban Jakarta residents?
- What are the sustainability challenges (environmental, social, and infrastructure) faced due to the development of suburban housing in the Bodetabek area?
- To what extent have suburban planning and development policies considered the principles of sustainable development?
- What kind of approach model can be used to integrate housing needs with sustainability principles in the buffer areas of Jakarta?

1.3 Research aim

This research aims to:
- Analyze the patterns and characteristics of suburban housing development in the Bodetabek area.

- Identify and examine sustainability challenges arising from housing development in the Jakarta buffer zone.
- Evaluate the effectiveness of suburban housing development policies and planning in supporting sustainable development.
- Offer a strategic approach or suburban housing development model that is able to integrate housing needs with sustainable spatial planning principles.

2 Literature review

This research will refer to several main theoretical frameworks which include:

2.1 Urban sprawl

The rapid growth that occurs in large cities in various parts of the world is often accompanied by the expansion of the city area towards the outskirts, a phenomenon known in theoretical studies as urban sprawl. This phenomenon has, is and will occur in the dynamics of regional development around the metropolitan city of Jakarta [10]. In a similar framework, this phenomenon is referred to as the Extended Metropolitan Region [11] to describe the expansion of the metropolitan area that encourages the emergence of medium-sized cities around it. The occurrence of the urban sprawl phenomenon has even become one of the main characteristics of the city growth process [12, 13]. Theoretically, several definitions of urban sprawl are shown in the Table 5 below [14].

Table 5. Re-examination of urban sprawl definitions.

No.	Defined by	Description/ characteristics
1.	Its repercussion of uncontrolled growth	Urban sprawl is the repercussion of the existence or the absence of development policy such as zoning, urban growth boundary or development control.
2.	Its unaesthetic and injustice design	Urban sprawl create clusters of homogenous design that produce unaesthetic or unpleasant view, its ugly suburban monotonous housing cause by poor planning or limited autonomy and cause social and economic injustice.
3.	Its driving forces	Urban sprawl is the dispersion of residential and employment development, industrial externalities, market forces and neighborhood incentives that push development further away.
4.	Its undesirable pattern of growth	Urban sprawl has a nasty pattern of development spreading further from the city such as leapfrogging, ribbon, strip development and periphery areas.
5.	Its expansion character and excessive growth	Urban sprawl expand excessively, with rapid urbanization and population spread outside their periphery and into rural area, convert and create spatial reorganization and functionality change.
6.	Its consequences to socio-environment	Urban sprawl affects and changes its environment such as loss of productive agricultural lands, lower accessibility and private transport dependency, increase carbon emission and increase runoff water.

2.2 Suburbanisation

Sub-Urbanization is a continuation of urbanization. The symptoms of urbanization that occur in almost all cities in the world, in some cases especially in cities in developing countries, lead to the formation of dense and slum cities. To reduce the burden on the city, urban growth

is directed to areas on the outskirts of the city which causes some city residents to move towards the suburbs as new growth centers [15]. Suburbanization refers to the process of population migration and economic activity from the city center to the suburbs, which results in the spatial growth of the city outward [16]. This phenomenon is often characterized by: Spread of low-density housing, Dependence on private vehicles, Large-scale land use.

The main factors driving suburbanization [17] which causes a shift in population and economic activity from the city center to the suburbs, are basically a combination of pull factors and push factors. Things that are included as pull factors include the desire of city center residents to seek a better life with better facilities and lower living costs in the suburbs. Meanwhile, the push factors are the accumulation of problems that arise in the city center including traffic congestion, air pollution, and population density.

The occurrence of the suburbanization phenomenon certainly brings consequences and impacts, both positive and negative. These impacts occur in many things related to spatial planning, humans, and infrastructure. Critical literature states that suburbanization has a number of consequences, such as environmental damage due to water and soil pollution due to unprepared infrastructure, air pollution due to large emissions from vehicles [18]. While the most important positive impact is the increasing quality of life of rural communities due to economic activity and increasing land prices [19].

2.3 Sustainable development

Sustainable housing development refers to a housing provision system that: meets the housing needs of the present without compromising the ability of future generations to meet them, integrates economic, social and environmental aspects, and promotes resource efficiency and social inclusiveness. According to UN-Habitat and the World Bank, sustainable housing must also be responsive to the local context, such as affordability, transport accessibility and environmental carrying capacity [20, 21].

Based on three main pillars: environment, social, and economy. This framework is important to evaluate whether suburban housing development has considered the balance of these three aspects. Sustainable development can only be achieved if development and environmental issues and problems receive equal attention in urban housing development. Basic human needs must be met, with improved living standards and our ecological systems maintained effectively [22]. One of the parameters and readiness that must be carried out to achieve sustainable housing development in suburban areas is through infrastructure planning and transportation management between the city center and development areas in the suburbs [23].

3 Research methods

This research is descriptive-qualitative in nature, taking the case of the Bumi Serpong Damai area in Tangerang, with the following details:

A qualitative approach is used to explore in depth the phenomenon of suburban housing development and its impacts. The case study focuses on one or more housing areas in BSD, Tangerang, selected due to their rapid suburban expansion and relevance to sustainable housing development.

3.1 Conceptual framework

The conceptual framework in this study describes the relationship between three main variables:

3.1.1 Housing needs

Displayed in the form of housing demand due to population growth, urbanization, and rising land prices in the city center and the tendency of people to seek alternative housing in suburban area.

3.1.2 Suburban development

Depicted in the form of large-scale housing development, lower-middle housing, and new residential areas in Bodetabek. The search focuses on cases that occur formally carried out by large developers.

3.1.3 Sustainability challenges

Review of environmental aspects (land conversion, pollution), social (spatial segregation, access to basic services), and infrastructure (transportation, clean water, sanitation).
Review of spatial planning policies, regional integration, and awareness of development actors towards sustainability principles.

Data for this study were collected from secondary sources, including official statistics by BPS Susenas in 2024, property market reports (Cushman & Wakefield, Leads Property), as well as relevant policy documents and spatial plans (RTRW/RDTR) pertaining to the Bodetabek area.

The data were analyzed using spreadsheet software (Microsoft Excel) to generate descriptive statistics and conduct inter-regional comparisons regarding housing supply, demand, backlog, and land conversion. Information extracted from policy documents and relevant literature was examined through thematic analysis to identify patterns in suburban housing development, housing needs, and sustainability-related challenges. The findings were subsequently synthesized to develop a conceptual model of sustainable suburban housing development in Jakarta's buffer zones.

3.2 Conseptual relations

The research, carried out using the detailed methods described previously, can be illustrated as follows (Figure 2), showing the linkages among urban growth, buffer-zone suburbanization, sustainable development, and the sustainable housing development model.

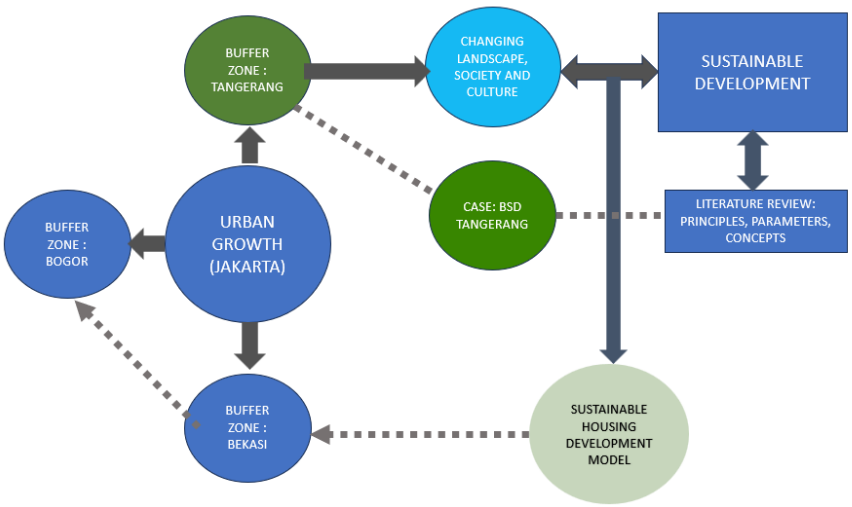

Fig. 2. Illustration of research conceptual relations.

4 Results and discussion

The rapid development of housing in Bodetabek not only reflects the dynamics of socio-economic needs, but also poses major challenges in terms of spatial planning and environmental sustainability. Massive changes in land use, increasing dependence on private vehicles, traffic congestion, and pressure on basic infrastructure (water, sanitation, transportation) are some of the consequences that arise. On the other hand, the existence of green open spaces and water catchment areas that are vital for the ecological balance of the Jabodetabek area are increasingly threatened by uncontrolled development expansion.

Housing in the Bodetabek area is now at an important crossroads between meeting basic housing needs and the need to maintain regional sustainability. Therefore, analysis of the dynamics, patterns, and impacts of suburban housing development in the Jakarta buffer zone is very relevant and urgent to be carried out.

4.1 Procurement of housing to meet national housing needs

Based on the 2024 BPS Socio-Economic Survey (Susenas), the housing backlog figure in Indonesia in 2024 is 9.9 million units. Although it has decreased from the 2022 backlog (10.1 million), the backlog figure is still considered high.

Jakarta's buffer zone contributes a significant portion of national landed housing development, because:

- Land availability is wider than in Central Jakarta.
- Basic infrastructure (roads, electricity, water) has been developed.
- The area's appeal as a place to live for Jakarta commuters.

However, there is a mismatch between the segment of houses built and the segment experiencing backlog, as described below (Table 6).

Table 6. The segment of houses built.

Segment of houses	Percentage built in buffer zone	Current requests from the community
Houses > 700 Million IDR	High	Low (only 15-20%)
Houses Rp 300–700 Million IDR	Middle	High (urban working class)
Houses < Rp 300 Million IDR	Low	Very high (Low income communities, main backlog)

Thus it can be concluded that most developers, especially large developers, focus more on the middle and upper segments. This is because the profit margin is higher, so the backlog for MBR (low-income communities) is not much affected by development in the buffer zone. As a result, the large number of housing units built, especially by large developers in the Jakarta buffer zone, does not contribute significantly to the housing backlog in Indonesia nationally.

Data from Cushman & Wakefield shows that the majority of landed houses marketed by developers in Tangerang, Bekasi, and Depok are in the price range of IDR 500 million to IDR 1.5 billion. This segment targets the upper-middle class, who generally have work flexibility (WFH or hybrid), private vehicles, and expectations of comfort and facilities in independent areas.

This condition directly causes problems because most workers who are still actively going to the office in Jakarta, especially in the middle sector (civil servants, private sector, manufacturing, retail), do not have purchasing power above IDR 700 million. This creates a mismatch between house prices and the profile of commuter workers. Commuter workers who cannot afford to buy a house in the area will live further out, increasing the time and cost of daily travel to Jakarta.

Another factor that emerged was the continued dependence of residents of housing around Jakarta and those who still work in the Jakarta area to use private vehicles as a means of transportation every day. This is because most of the new housing areas are not directly connected to KRL stations or public transportation terminals. Thus, it is very likely to increase the carbon footprint, which is contrary to the goals of a low-carbon city and climate change mitigation. The problem of suburban housing that is not inclusive and not integrated with public transportation is contrary to the principles of sustainable development. Without policy intervention and sustainability-based spatial planning, Jakarta's buffer zone is at risk of becoming an unresilient urban area - expensive, fragmented, and environmentally unfriendly.

UN-Habitat, through the New Urban Agenda (NUA) adopted at the Habitat III conference, emphasizes the importance of: national urban policies that promote integrated systems of cities and human settlements for sustainable urban development. Example in BSD City: although there is a Cisauk station and an internal shuttle, not all housing clusters have direct or pedestrian-friendly access to this network. This condition creates traffic pressure on toll roads and carbon emissions.

Another impact that is feared to emerge is the occurrence of social and spatial segregation: low-income groups are pushed to the more distant fringes (peri-urban), with more limited access to city facilities and infrastructure. Linked to the principle of sustainable development, this does not support the principle of social inclusiveness and spatial justice (social sustainability), and creates inequality in access to decent housing, jobs, and transportation.

From an economic perspective, which includes investment costs and productivity, problems arise due to the conditions where workers have to travel far and expensively to Jakarta every day due to limited affordable housing near the work center. On the other hand, high travel time reduces productivity and quality of life. Thus, when associated with

sustainable development, there is a mismatch, where what happens is a situation that creates macro and micro economic inefficiencies (transportation costs, travel time, energy consumption). And directly contributes to the burden of the metropolitan economy through congestion and infrastructure pressure.

Thus, if included in the Sustainable Development scheme, the phenomenon of suburban housing is as follows (Table 7):

Table 7. Dimensions of sustainable development in suburban housing.

Dimensions of sustainable development	The problem of suburban housing	Impact
Social	Inability of commuters to reach housing in the area	Social inequality and spatial alienation
Environment	Urban sprawl and dependence on private vehicles	Increased emissions, ecological damage
Economy	High mileage, logistics and mobility costs	Low productivity and high cost of living

4.2 Respons and global strategy

A number of global approaches have been developed to respond to the challenges of suburbanization to achieve sustainable suburban housing development parameters, including:

Transit-Oriented Development (TOD) to reduce car dependency. TOD principles encourage people to use public transportation or walk as a means of transportation to reach their destinations as an alternative to relying on cars. TOD can also be a catalyst for sustainable economic development by providing a sense of place with a mix of uses, housing options, and amenities that serve all generations [24] (Figure 3).

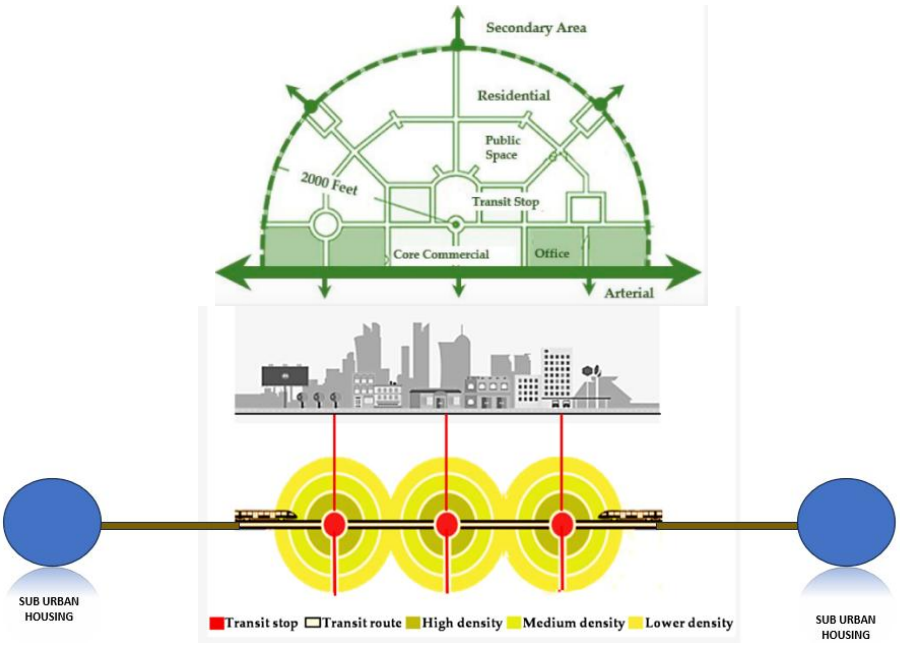

Fig. 3. Illustration of TOD implementation to connect suburban housing with the city center of Jakarta [25].

Other concepts that can be used as a problem approach are Smart Growth and Compact City to improve land use efficiency. In response to the expansion and contraction of urban areas, two paradigms have emerged in the academic and professional community, known as smart growth (SG) and smart shrinkage (SS) [26] (Figure 4).

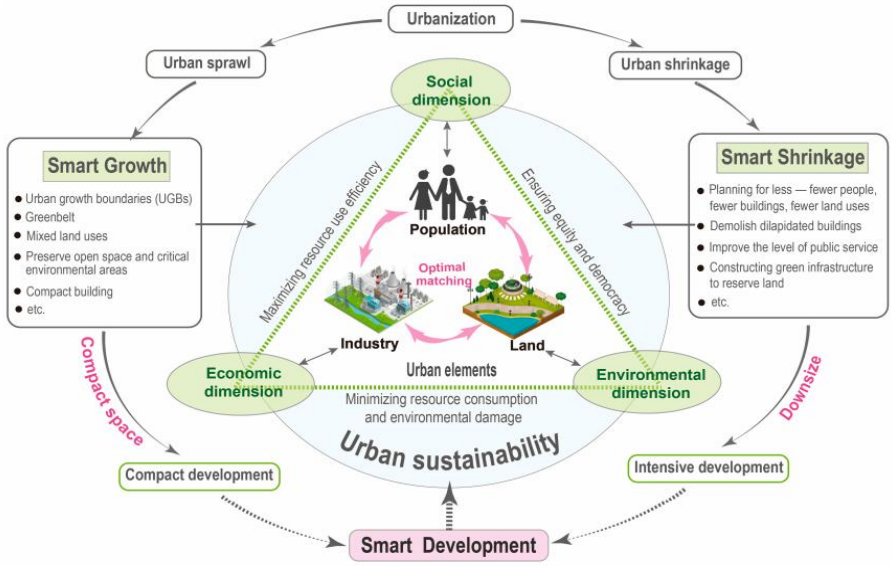

Fig. 4. Theoretical framework of "Smart Development" for urban sustainable development [26].

Coordination and alignment of perceptions and steps from all stakeholders that produce spatial planning policies are the main requirements for policy implementation to ensure services for all levels of society as a reflection of sustainable housing development. Provision of services carried out by regional planning authorities can be improved through policy coordination. To avoid delays in the development process, communication and understanding between the public and private sectors are essential so that it can benefit society as a whole and thus achieve sustainable housing goals [22] (Figure 5).

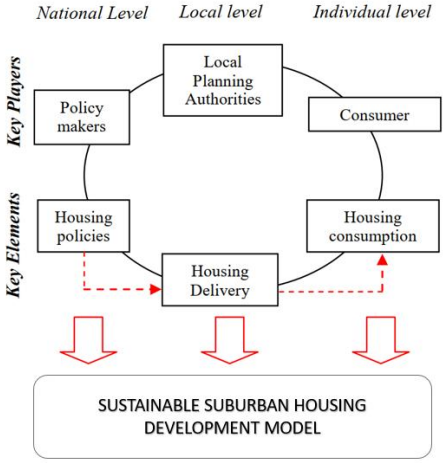

Fig. 5. Spatial planning policies for all levels of society [22].

5 Conclusion

The above quotations and discussions indicate that housing development in the buffer zone of Jakarta, including Tangerang, needs to consider:

5.1 Integration with public transportation to reduce dependence on private vehicles

Provision of affordable housing for workers who work in Jakarta. TOD can reduce dependence on private vehicles and encourage the use of public transportation, thus supporting sustainable urban development

5.2 Sustainability principles need to be applied in the planning and development of the suburban area as a whole

Thus, the housing development strategy in the suburban area must be in line with the sustainable development agenda to create an inclusive, liveable, and environmentally friendly environment.

This study contributes to the academic discourse by providing an integrated conceptual understanding of the interactions among housing needs, suburban development dynamics, and sustainability challenges within Jakarta's buffer zones, offering a structured model for sustainable suburban housing development.

However, the research is limited by its reliance on secondary data, which may restrict the depth of empirical validation.

Future studies are recommended to adopt mixed-method approaches, including household surveys and spatial modelling, to further examine the socio-economic behaviour of suburban residents and validate sustainable suburban development frameworks across multiple buffer-zone locations.

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The development of suburban housing: Between needs and sustainability challenges

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Abstract. The development of suburban housing by developers continues to increase along with population growth and the need for affordable housing. This phenomenon provides economic opportunities but also poses serious challenges in the context of sustainable development. This study adopts a descriptive–qualitative research design, focusing on the case of Jakarta's suburban buffer zone to examine development patterns, spatial transformations, and emerging sustainability issues. This study analyzes how suburban housing development practices meet the principles of sustainable development, including environmental, social, and economic aspects. Previous research findings show that many developers focus on physical expansion without considering land conservation, water resource management, and efficient transportation connectivity. The impacts are fragmentation of natural habitats, increased carbon emissions, and reduced quality of life due to lack of public facilities and green open spaces. However, several innovative projects have begun to adopt the concept of green cities with a sustainable spatial approach, use of environmentally friendly materials, and integration of social infrastructure. The findings indicate that although some improvements have emerged, suburban housing development remains insufficiently aligned with sustainability principles, particularly in terms of transit integration, equitable access, and long-term environmental resilience. This study emphasizes the importance of government regulation, developer awareness, and community participation in encouraging more inclusive and sustainable housing development. With the right approach, suburban housing development can not only meet housing needs but also support environmental sustainability and long-term social welfare.

1 Introduction

Until now, the issue of urbanization is still a dominant phenomenon that accompanies the growth of big cities in the world [1, 2]. Globally, urbanization has dramatically increased from 30% in 1950 to 55% in 2018, and is projected to rise to 68% by 2050. More developed

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regions are expected to have a higher proportion of their population living in urban areas by 2050, reaching 86.6%. Significant urban population growth is anticipated in India, China, and Nigeria, with these countries contributing 35% of the overall global increase between 2018 and 2050 (Figure 1). This global trend has intensified the demand for affordable housing and has triggered widespread suburban expansion to accommodate the rapid influx of population.

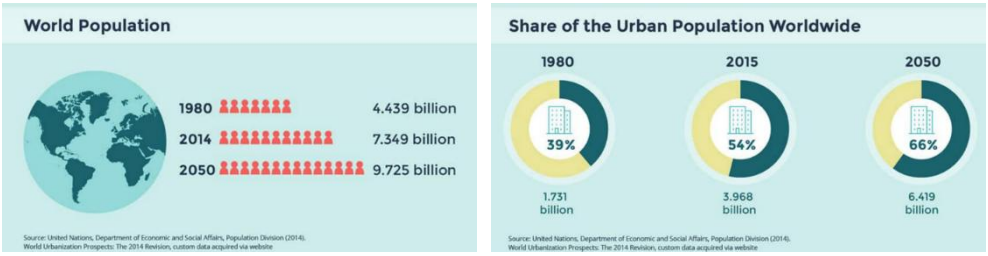

Fig. 1. The distribution of the world's population residing in rural and urban areas [3].

The Jakarta area as the nation's capital has experienced very high urbanization pressure in recent decades [4, 5]. The inability of the core area of Jakarta to accommodate population growth and housing needs has driven the expansion of housing to buffer areas known as the Bodetabek area (Bogor, Depok, Tangerang, and Bekasi). This phenomenon is known as suburbanization [6].

The buffer areas of Jakarta have been chosen as the main locations for housing provision due to lower land prices compared to the city center [7]. This indicates that the buffer areas have become the primary destination for new housing for workers seeking more affordable residential options outside the city center.

The following (Table 1 – Table 4) are the latest statistical data regarding the growth in the number of houses and the area of new housing land in the Jakarta buffer zone (Bogor, Depok, Tangerang, and Bekasi) during 2023-2024.

Table 1. Number of landed houses by region (2023–2024) [8].

Area	Total landed housing units	Demand units	Percentage of demand
Tangerang	211.064 unit	199.996 unit	94.7%
Bogor-Depok	88.637 unit	82.076 unit	92.6%
Bekasi	95.399 unit	92.811 unit	97.3%
Jakarta	26.345 unit	22.873 unit	86.8%

Table 2. Supply of new landed houses semester II 2023 [8].

Area	New supply percentage
Tangerang	65%
Bogor-Depok	14% (mix)
Bekasi	Data not available
Jakarta	Data not available

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Table 3. Annual (YoY) landed home supply growth as of quartal 3 2024 [9].

Area	Supply growth (%)	Price growth (%)
Tangerang	14.4%	3.5%
Bekasi	7.0%	3.0%
Depok	4.2%	12.3%
Bogor	3.7%	4.3%
Jakarta	4.1%	5.2%

Table 4. Built-up housing land area and development potential [9].

Area	Built Up Area (ha)	Total Concession (ha)	Bilt up Percentage
Tangerang	6.482 ha	17.241 ha	37.6%
Bekasi	3.805 ha	13.340 ha	28.5%
Bogor-Depok	2.836 ha	19.208 ha	14.8%
Jakarta	593 ha	1.094 ha	54.2%

The development and expansion of housing in the areas around Jakarta as depicted in the tables can be linked to three studies. The first is the influence of the existence of new housing on the pre-existing environment, both physical and non-physical. Second, the relationship with the consequences of infrastructure in relation to the local city center and the city of Jakarta as a growth center. The third is the relationship with the shortage of housing supply (housing backlog) nationally.

However, the majority of existing scholarship has predominantly concentrated on the consequences of urbanization and metropolitan expansion, whereas comprehensive investigations into sustainability challenges, especially those examining the interrelations among land conversion, infrastructure disparities, environmental degradation, and socio-spatial inequality in suburban housing, remain limited.

There is a research gap in the limited integration of environmental, social, and infrastructural dimensions in suburban housing studies, particularly in rapidly growing regions such as Bodetabek. Previous research has yet to provide a holistic assessment of how suburban housing development aligns with sustainable development principles or how policy frameworks respond to emerging spatial challenges. The novelty of this study lies in its multi-dimensional assessment of suburban housing, combining perspectives of sustainability, spatial planning, and socio-economic dynamics, using Bodetabek as its case study.

1.1 Urgency of research

This research has high urgency, among other things because of data from related institutions (Central Statistics Agency, Housing and Settlements, Ministry of Public Works) and previous research results which show the following conditions:

1.1.1 Population growth and housing needs in Jakarta's buffer zone

The high population growth rate in Jakarta and its buffer zone has increased pressure on the availability of housing land. Without proper planning, the risk of slums and land use conflicts will increase.

1.1.2 Environmental damage and decrease in regional carrying capacity

The conversion of agricultural land and green open spaces into residential areas has a direct impact on environmental degradation, flood risk, and loss of local biodiversity.

1.1.3 Infrastructure and mobility disparities

Many housing areas in Bodetabek were built without adequate infrastructure support, especially public transportation. Dependence on private vehicles worsens congestion and increases carbon emissions, which is contrary to the goals of sustainable development.

1.1.4 Lack of integration in regional planning

Fragmentation in policies and planning between local governments in the Bodetabek area has resulted in unsynchronized development between regions, which complicates efforts to organize the region comprehensively.

Accordingly, this study aims to examine the extent to which suburban housing development practices in Jakarta's buffer zones conform to the principles of sustainable development, encompassing environmental, social, and economic dimensions.

By considering these contexts, this study is expected to provide academic and practical contributions in formulating a housing development approach in suburban areas that is oriented towards sustainability, especially in the buffer zones of Jakarta. The results of this study can be used as strategic input for city planners, housing developers, and policy makers at the local and national levels.

1.2 Research question

Based on the background that has been explained, the formulation of the problem in this study is as follows:
- How are the dynamics of housing development in the suburban areas of Bodetabek in responding to the housing needs of urban Jakarta residents?
- What are the sustainability challenges (environmental, social, and infrastructure) faced due to the development of suburban housing in the Bodetabek area?
- To what extent have suburban planning and development policies considered the principles of sustainable development?
- What kind of approach model can be used to integrate housing needs with sustainability principles in the buffer areas of Jakarta?

1.3 Research aim

This research aims to:
- Analyze the patterns and characteristics of suburban housing development in the Bodetabek area.

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- Identify and examine sustainability challenges arising from housing development in the Jakarta buffer zone.
- Evaluate the effectiveness of suburban housing development policies and planning in supporting sustainable development.
- Offer a strategic approach or suburban housing development model that is able to integrate housing needs with sustainable spatial planning principles.

2 Literature review

This research will refer to several main theoretical frameworks which include:

2.1 Urban sprawl

The rapid growth that occurs in large cities in various parts of the world is often accompanied by the expansion of the city area towards the outskirts, a phenomenon known in theoretical studies as urban sprawl. This phenomenon has, is and will occur in the dynamics of regional development around the metropolitan city of Jakarta [10]. In a similar framework, this phenomenon is referred to as the Extended Metropolitan Region [11] to describe the expansion of the metropolitan area that encourages the emergence of medium-sized cities around it. The occurrence of the urban sprawl phenomenon has even become one of the main characteristics of the city growth process [12, 13]. Theoretically, several definitions of urban sprawl are shown in the Table 5 below [14].

Table 5. Re-examination of urban sprawl definitions.

No.	Defined by	Description/ characteristics
1.	Its repercussion of uncontrolled growth	Urban sprawl is the repercussion of the existence or the absence of development policy such as zoning, urban growth boundary or development control.
2.	Its unaesthetic and injustice design	Urban sprawl create clusters of homogenous design that produce unaesthetic or unpleasant view, its ugly suburban monotonous housing cause by poor planning or limited autonomy and cause social and economic injustice.
3.	Its driving forces	Urban sprawl is the dispersion of residential and employment development, industrial externalities, market forces and neighborhood incentives that push development further away.
4.	Its undesirable pattern of growth	Urban sprawl has a nasty pattern of development spreading further from the city such as leapfrogging, ribbon, strip development and periphery areas.
5.	Its expansion character and excessive growth	Urban sprawl expand excessively, with rapid urbanization and population spread outside their periphery and into rural area, convert and create spatial reorganization and functionality change.
6.	Its consequences to socio-environment	Urban sprawl affects and changes its environment such as loss of productive agricultural lands, lower accessibility and private transport dependency, increase carbon emission and increase runoff water.

2.2 Suburbanisation

Sub-Urbanization is a continuation of urbanization. The symptoms of urbanization that occur in almost all cities in the world, in some cases especially in cities in developing countries, lead to the formation of dense and slum cities. To reduce the burden on the city, urban growth

is directed to areas on the outskirts of the city which causes some city residents to move towards the suburbs as new growth centers [15]. Suburbanization refers to the process of population migration and economic activity from the city center to the suburbs, which results in the spatial growth of the city outward [16]. This phenomenon is often characterized by: Spread of low-density housing, Dependence on private vehicles, Large-scale land use.

The main factors driving suburbanization [17] which causes a shift in population and economic activity from the city center to the suburbs, are basically a combination of pull factors and push factors. Things that are included as pull factors include the desire of city center residents to seek a better life with better facilities and lower living costs in the suburbs. Meanwhile, the push factors are the accumulation of problems that arise in the city center including traffic congestion, air pollution, and population density.

The occurrence of the suburbanization phenomenon certainly brings consequences and impacts, both positive and negative. These impacts occur in many things related to spatial planning, humans, and infrastructure. Critical literature states that suburbanization has a number of consequences, such as environmental damage due to water and soil pollution due to unprepared infrastructure, air pollution due to large emissions from vehicles [18]. While the most important positive impact is the increasing quality of life of rural communities due to economic activity and increasing land prices [19].

2.3 Sustainable development

Sustainable housing development refers to a housing provision system that: meets the housing needs of the present without compromising the ability of future generations to meet them, integrates economic, social and environmental aspects, and promotes resource efficiency and social inclusiveness. According to UN-Habitat and the World Bank, sustainable housing must also be responsive to the local context, such as affordability, transport accessibility and environmental carrying capacity [20, 21].

Based on three main pillars: environment, social, and economy. This framework is important to evaluate whether suburban housing development has considered the balance of these three aspects. Sustainable development can only be achieved if development and environmental issues and problems receive equal attention in urban housing development. Basic human needs must be met, with improved living standards and our ecological systems maintained effectively [22]. One of the parameters and readiness that must be carried out to achieve sustainable housing development in suburban areas is through infrastructure planning and transportation management between the city center and development areas in the suburbs [23].

3 Research methods

This research is descriptive-qualitative in nature, taking the case of the Bumi Serpong Damai area in Tangerang, with the following details:

A qualitative approach is used to explore in depth the phenomenon of suburban housing development and its impacts. The case study focuses on one or more housing areas in BSD, Tangerang, selected due to their rapid suburban expansion and relevance to sustainable housing development.

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3.1 Conceptual framework

The conceptual framework in this study describes the relationship between three main variables:

3.1.1 Housing needs

Displayed in the form of housing demand due to population growth, urbanization, and rising land prices in the city center and the tendency of people to seek alternative housing in suburban area.

3.1.2 Suburban development

Depicted in the form of large-scale housing development, lower-middle housing, and new residential areas in Bodetabek. The search focuses on cases that occur formally carried out by large developers.

3.1.3 Sustainability challenges

Review of environmental aspects (land conversion, pollution), social (spatial segregation, access to basic services), and infrastructure (transportation, clean water, sanitation).
Review of spatial planning policies, regional integration, and awareness of development actors towards sustainability principles.

Data for this study were collected from secondary sources, including official statistics by BPS Susenas in 2024, property market reports (Cushman & Wakefield, Leads Property), as well as relevant policy documents and spatial plans (RTRW/RDTR) pertaining to the Bodetabek area.

The data were analyzed using spreadsheet software (Microsoft Excel) to generate descriptive statistics and conduct inter-regional comparisons regarding housing supply, demand, backlog, and land conversion. Information extracted from policy documents and relevant literature was examined through thematic analysis to identify patterns in suburban housing development, housing needs, and sustainability-related challenges. The findings were subsequently synthesized to develop a conceptual model of sustainable suburban housing development in Jakarta's buffer zones.

3.2 Conseptual relations

The research, carried out using the detailed methods described previously, can be illustrated as follows (Figure 2), showing the linkages among urban growth, buffer-zone suburbanization, sustainable development, and the sustainable housing development model.

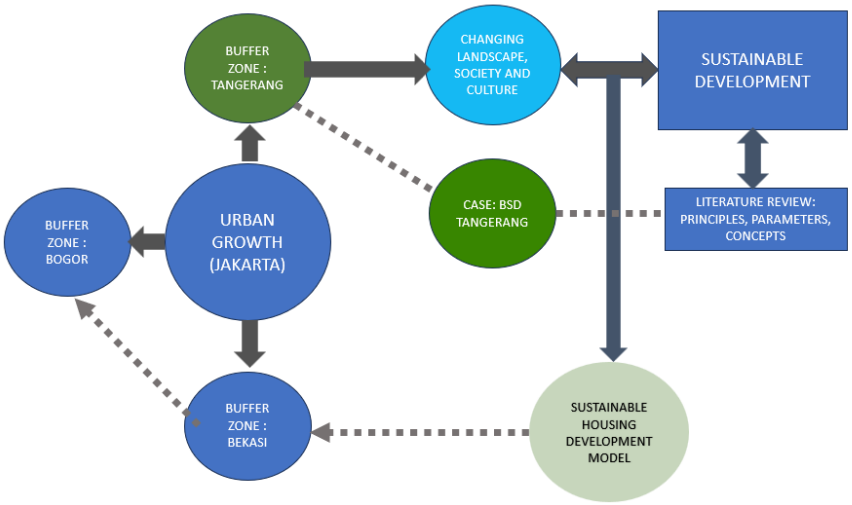

Fig. 2. Illustration of research conceptual relations.

4 Results and discussion

The rapid development of housing in Bodetabek not only reflects the dynamics of socio-economic needs, but also poses major challenges in terms of spatial planning and environmental sustainability. Massive changes in land use, increasing dependence on private vehicles, traffic congestion, and pressure on basic infrastructure (water, sanitation, transportation) are some of the consequences that arise. On the other hand, the existence of green open spaces and water catchment areas that are vital for the ecological balance of the Jabodetabek area are increasingly threatened by uncontrolled development expansion.

Housing in the Bodetabek area is now at an important crossroads between meeting basic housing needs and the need to maintain regional sustainability. Therefore, analysis of the dynamics, patterns, and impacts of suburban housing development in the Jakarta buffer zone is very relevant and urgent to be carried out.

4.1 Procurement of housing to meet national housing needs

Based on the 2024 BPS Socio-Economic Survey (Susenas), the housing backlog figure in Indonesia in 2024 is 9.9 million units. Although it has decreased from the 2022 backlog (10.1 million), the backlog figure is still considered high.

Jakarta's buffer zone contributes a significant portion of national landed housing development, because:

- Land availability is wider than in Central Jakarta.
- Basic infrastructure (roads, electricity, water) has been developed.
- The area's appeal as a place to live for Jakarta commuters.

However, there is a mismatch between the segment of houses built and the segment experiencing backlog, as described below (Table 6).

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Table 6. The segment of houses built.

Segment of houses	Percentage built in buffer zone	Current requests from the community
Houses > 700 Million IDR	High	Low (only 15-20%)
Houses Rp 300–700 Million IDR	Middle	High (urban working class)
Houses < Rp 300 Million IDR	Low	Very high (Low income communities, main backlog)

Thus it can be concluded that most developers, especially large developers, focus more on the middle and upper segments. This is because the profit margin is higher, so the backlog for MBR (low-income communities) is not much affected by development in the buffer zone. As a result, the large number of housing units built, especially by large developers in the Jakarta buffer zone, does not contribute significantly to the housing backlog in Indonesia nationally.

Data from Cushman & Wakefield shows that the majority of landed houses marketed by developers in Tangerang, Bekasi, and Depok are in the price range of IDR 500 million to IDR 1.5 billion. This segment targets the upper-middle class, who generally have work flexibility (WFH or hybrid), private vehicles, and expectations of comfort and facilities in independent areas.

This condition directly causes problems because most workers who are still actively going to the office in Jakarta, especially in the middle sector (civil servants, private sector, manufacturing, retail), do not have purchasing power above IDR 700 million. This creates a mismatch between house prices and the profile of commuter workers. Commuter workers who cannot afford to buy a house in the area will live further out, increasing the time and cost of daily travel to Jakarta.

Another factor that emerged was the continued dependence of residents of housing around Jakarta and those who still work in the Jakarta area to use private vehicles as a means of transportation every day. This is because most of the new housing areas are not directly connected to KRL stations or public transportation terminals. Thus, it is very likely to increase the carbon footprint, which is contrary to the goals of a low-carbon city and climate change mitigation. The problem of suburban housing that is not inclusive and not integrated with public transportation is contrary to the principles of sustainable development. Without policy intervention and sustainability-based spatial planning, Jakarta's buffer zone is at risk of becoming an unresilient urban area - expensive, fragmented, and environmentally unfriendly.

UN-Habitat, through the New Urban Agenda (NUA) adopted at the Habitat III conference, emphasizes the importance of: national urban policies that promote integrated systems of cities and human settlements for sustainable urban development. Example in BSD City: although there is a Cisauk station and an internal shuttle, not all housing clusters have direct or pedestrian-friendly access to this network. This condition creates traffic pressure on toll roads and carbon emissions.

Another impact that is feared to emerge is the occurrence of social and spatial segregation: low-income groups are pushed to the more distant fringes (peri-urban), with more limited access to city facilities and infrastructure. Linked to the principle of sustainable development, this does not support the principle of social inclusiveness and spatial justice (social sustainability), and creates inequality in access to decent housing, jobs, and transportation.

From an economic perspective, which includes investment costs and productivity, problems arise due to the conditions where workers have to travel far and expensively to Jakarta every day due to limited affordable housing near the work center. On the other hand, high travel time reduces productivity and quality of life. Thus, when associated with

sustainable development, there is a mismatch, where what happens is a situation that creates macro and micro economic inefficiencies (transportation costs, travel time, energy consumption). And directly contributes to the burden of the metropolitan economy through congestion and infrastructure pressure.

Thus, if included in the Sustainable Development scheme, the phenomenon of suburban housing is as follows (Table 7):

Table 7. Dimensions of sustainable development in suburban housing.

Dimensions of sustainable development	The problem of suburban housing	Impact
Social	Inability of commuters to reach housing in the area	Social inequality and spatial alienation
Environment	Urban sprawl and dependence on private vehicles	Increased emissions, ecological damage
Economy	High mileage, logistics and mobility costs	Low productivity and high cost of living

4.2 Respons and global strategy

A number of global approaches have been developed to respond to the challenges of suburbanization to achieve sustainable suburban housing development parameters, including:

Transit-Oriented Development (TOD) to reduce car dependency. TOD principles encourage people to use public transportation or walk as a means of transportation to reach their destinations as an alternative to relying on cars. TOD can also be a catalyst for sustainable economic development by providing a sense of place with a mix of uses, housing options, and amenities that serve all generations [24] (Figure 3).

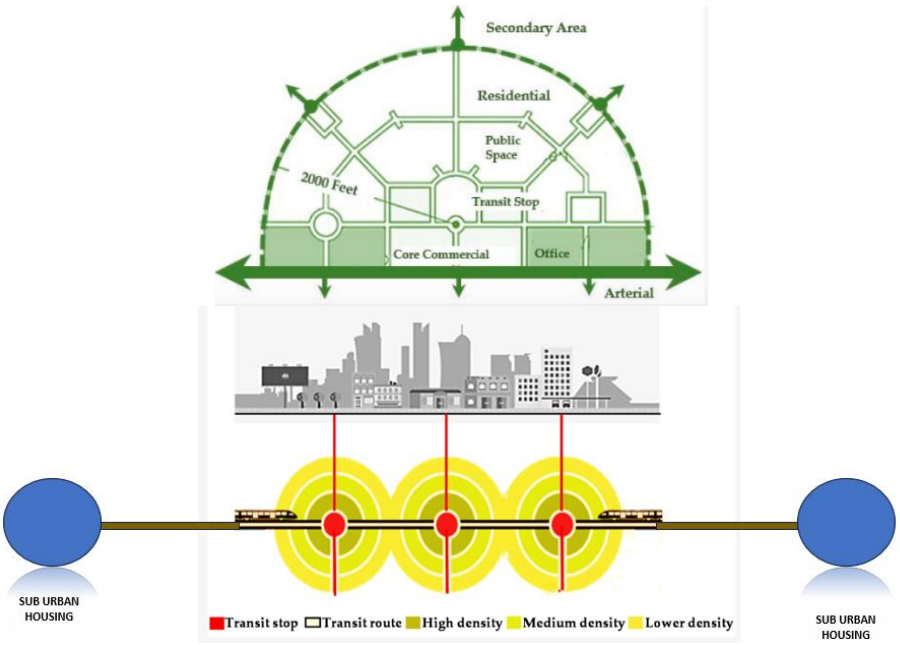

Fig. 3. Illustration of TOD implementation to connect suburban housing with the city center of Jakarta [25].

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Other concepts that can be used as a problem approach are Smart Growth and Compact City to improve land use efficiency. In response to the expansion and contraction of urban areas, two paradigms have emerged in the academic and professional community, known as smart growth (SG) and smart shrinkage (SS) [26] (Figure 4).

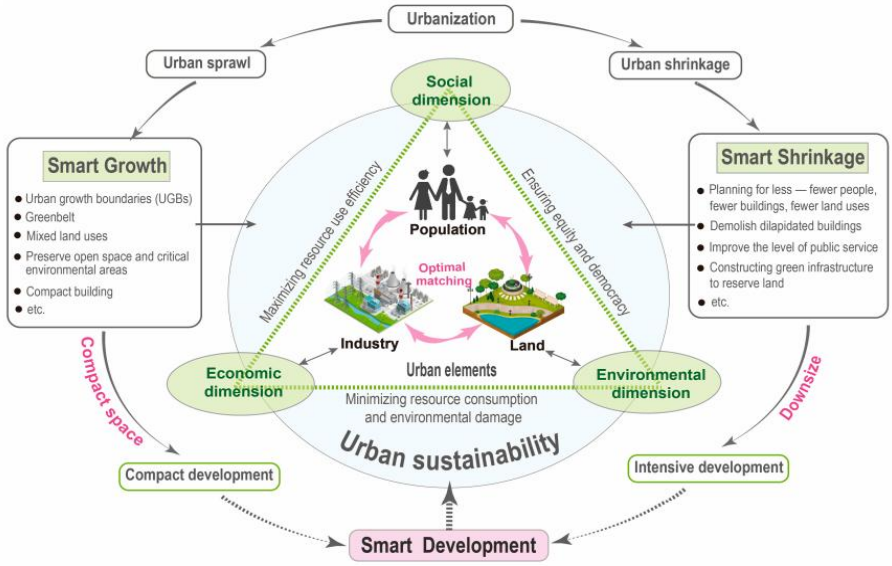

Fig. 4. Theoretical framework of "Smart Development" for urban sustainable development [26].

Coordination and alignment of perceptions and steps from all stakeholders that produce spatial planning policies are the main requirements for policy implementation to ensure services for all levels of society as a reflection of sustainable housing development. Provision of services carried out by regional planning authorities can be improved through policy coordination. To avoid delays in the development process, communication and understanding between the public and private sectors are essential so that it can benefit society as a whole and thus achieve sustainable housing goals [22] (Figure 5).

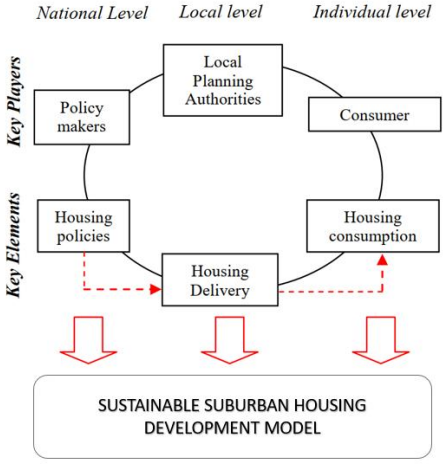

Fig. 5. Spatial planning policies for all levels of society [22].

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5 Conclusion

The above quotations and discussions indicate that housing development in the buffer zone of Jakarta, including Tangerang, needs to consider:

5.1 Integration with public transportation to reduce dependence on private vehicles

Provision of affordable housing for workers who work in Jakarta. TOD can reduce dependence on private vehicles and encourage the use of public transportation, thus supporting sustainable urban development

5.2 Sustainability principles need to be applied in the planning and development of the suburban area as a whole

Thus, the housing development strategy in the suburban area must be in line with the sustainable development agenda to create an inclusive, liveable, and environmentally friendly environment.

This study contributes to the academic discourse by providing an integrated conceptual understanding of the interactions among housing needs, suburban development dynamics, and sustainability challenges within Jakarta's buffer zones, offering a structured model for sustainable suburban housing development.

However, the research is limited by its reliance on secondary data, which may restrict the depth of empirical validation.

Future studies are recommended to adopt mixed-method approaches, including household surveys and spatial modelling, to further examine the socio-economic behaviour of suburban residents and validate sustainable suburban development frameworks across multiple buffer-zone locations.

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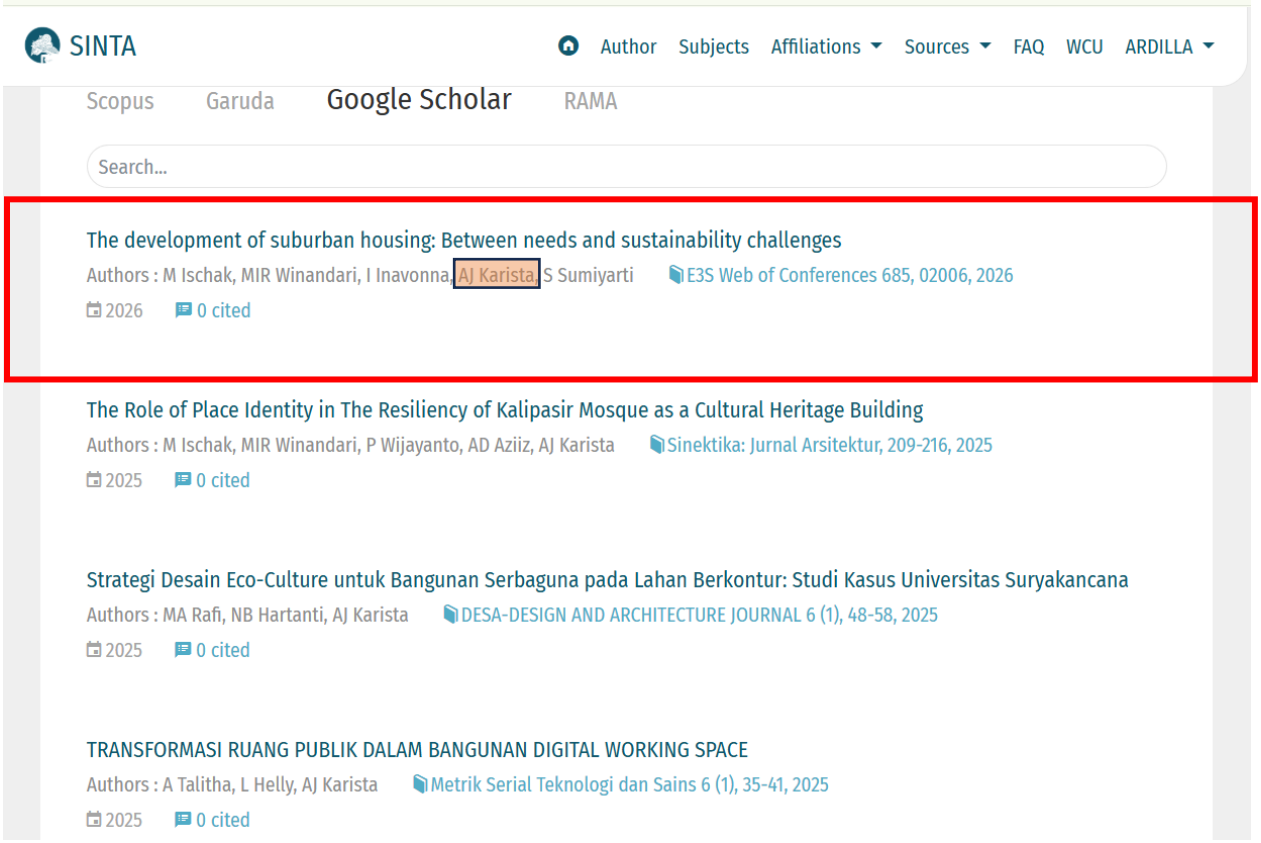
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