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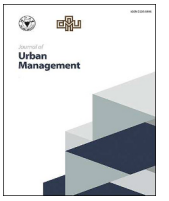

Case Report

Karawang's transformation: The trilemma and mega transport-driven urbanism

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ABSTRACT

Karawang, strategically situated between Jakarta and Bandung, illustrates the complex dynamics of peri-urban transformation in Indonesia. Historically, a key agricultural and industrial region, Karawang has increasingly evolved into a commuter and residential extension of Jakarta. However, unlike other peri-urban municipalities officially integrated into Jakarta's metropolitan governance, Karawang remains absent from strategic plans despite bearing greater environmental and developmental burdens. Recent Mega Transport Infrastructure Projects (MTIPs) have reduced travel time to mere minutes and are appealing as a prime residential destination for Jakarta's workforce, besides triggering uneven land development, speculative housing markets, and the marginalization of agricultural livelihoods. This study highlights the rise of exclusive residential enclaves near toll gates and increasing reliance on private vehicles, while many areas remain underserved by public transport. Adding to the lack of coordination between national and local planning, the transport-driven urban growth of Karawang overlooks issues of equity, sustainability, and identity. This study explores Karawang's historical evolution as the second-layer region inseparable from Jakarta, highlighting its organic yet precarious urban transformation triggered by the MTIP under the trilemma, offering a fresh perspective on Karawang urban transitions, illustrating how a once-marginalized city is reshaping identity in the face of relentless metropolitan expansion and infrastructural connectivity.

1. Getting to know Karawang

Urban expansion and population growth have become defining features of many emerging cities in the Global South (de Satge & Watson, 2018; Follmann et al., 2023; Karpouzoglou et al., 2018; G. C. S. Lin, 2009; Sotomayor & Daniere, 2017), including Indonesia. This growth is increasing demands for land, water, food, housing, and public facilities, particularly transport infrastructure networks, public services, and utilities, which should be more equitable and spatially distributed to sustain economic activity and urban functionality. However, it also poses critical challenges, especially in Indonesian peri-urban and agricultural areas, where urbanization

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often leads to massive conversion into built-up areas (Mulya & Hudalah, 2024; Widyastuti & Sari, 2024). These trends are evident. As Rukmana (2018) noted, urban expansion in Indonesia continues to encroach upon fertile agricultural land, threatening future food security and intensifying competition over critical and increasingly scarce resources, such as land and water. This has led to social tensions, land speculation, and the displacement of vulnerable groups. Since the 1990s, these dynamics—once concentrated around Jakarta—have spread to other medium-sized cities through large-scale developments led by private actors in collaboration with state agencies (Herlambang et al., 2018; Winarso & Firman, 2002).

Previous studies on Jakarta's urban expansion have primarily focused on Bekasi, Tangerang, and Bogor, where urban growth follows a more structured and policy-driven trajectory (Firman & Dharmapatni, 1994). This study, instead, pays utmost attention to Karawang. It illustrates how some areas can organically evolve into urban areas, with growth primarily driven by private sector investment rather than integrated public planning. In the case of Karawang, this transformation has occurred without clear coordination between national infrastructure strategies and regional or local spatial planning frameworks. As a result, development unfolds in a fragmented manner, with private actors often steering the pace and direction of urban change, while public planning struggles to keep up or guide it coherently (Talitha et al., 2020). This phenomenon is partly influenced by Indonesia's planning culture, where, despite decentralization efforts, local governments often find it difficult to pursue autonomy but are still controlled by the central government (Winarni, 2024). As a result, overlapping and inconsistent spatial planning policies are unavoidable. Hence, by focusing on the transformation of the Karawang urban area, this study proposes to depict an overlooked yet rapidly transforming urban area. Urban growth theories suggest that transportation infrastructure is a primary driver of peri-urban expansion (Cervero, 2014). However, the case of Karawang presents a unique dynamic, where new transport connectivity has not yet been accompanied by a clear metropolitan planning strategy.

Karawang, located strategically between Jakarta and Bandung, illustrates this uneven and conflicted transformation. This region is one such area that illustrates how urbanization is changing and transforming the peri-urban. Once known for its agricultural region, Karawang has increasingly become an industrial and infrastructure-driven urban space. Megaprojects such as the MBZ elevated toll road, the Jakarta-Bandung high-speed train (Whoosh), and the Cikampek toll interchange have catalyzed urban characteristics, particularly in districts surrounding the nodes. Yet the area lacks formal administrative recognition as a city. This shift has created a crisis of identity, not in the sense that Karawang must adopt a singular urban character, but in how overlapping land uses, fragmented governance, and conflicting development trajectories have produced planning uncertainty and spatial dissonance. The tension is caught between its rural and agrarian past, its rapid industrial expansion, and the rise of concentrated, glamorous residential enclaves near toll exits, which cater to commuters and the upper middle class, creating a trilemma of these three roles. These contrasting land uses and social groups coexist uneasily, underscoring the fragmented and uneven nature of peri-urban development. Karawang thus serves as a powerful example of the challenges many peri-urban regions face in Indonesia and beyond.

Throughout history, Karawang has undergone an unbelievably rapid transformation. Located in West Java, approximately 70 km east of Jakarta, even during the colonial era, Karawang was historically well-known as an agricultural center and one of the major rice-producing regions in Indonesia, earning the title of "the rice granary of West Java." (BPS - Statistics of Karawang Regency, 2024). However, since the 1980s and 1990s, massive industrial expansion has contributed to rapid urbanization, resulting in the decline of the agricultural area in Karawang, which has transformed into an urban area and business center, particularly along the Cikampek highway route (Hudalah et al., 2024). Today, Karawang is home to large-scale manufacturing hubs producing automotive components, electronics, pharmaceuticals, and consumer goods. Additionally, it is home to multinational factories such as Toyota, Honda, and Yamaha, underscoring its pivotal role in Indonesia's industrial economy (JICA, 2015). In addition, Karawang is undergoing another major transition, turning into a supported residential area, economic/business expansion of the Jakarta Metropolitan Area (JMA), and

Fig. 1. The entrance to the so-called city of Karawang source: Google Earth, 2025

improved transport accessibility. As a result of these rapid developments, Karawang suffered environmental and identity crises, including social inequity due to massive land conversion and the absence of formal metropolitan planning frameworks.

Administratively, Karawang, as a larger region, is classified as a regency (*kabupaten*) with a total area of 1.931,71 km^2, distinguishing it from other metropolitan cities like Bekasi and Tangerang. It shares borders with Bekasi Regency to the west, Subang Regency to the east, and Bogor Regency to the south (BPS - Statistics of Karawang Regency, 2024). Strategically positioned between Jakarta and Bandung, Karawang serves as a critical link between the two major urban centers due to its access to major highways, rail networks, and ports, which play a crucial role in shaping its economic development (JICA, 2015). However, the area referred to as the city of "Karawang" or "Karawang Urban Area" in this study (which consists of four subdistricts, including West Karawang, East Karawang, East Telukjambe, and West Telukjambe) is approximately 188 km^2 or 9.8 percent of Karawang Regency (BPS - Statistics of Karawang Regency, 2024) and not officially defined as or under the jurisdiction of a city, but rather an organically formed urban region shaped by market forces, population inflow, the externalities of Jakarta's expansion, and MTIPs. These four districts experienced significant urban expansion from 2005 to 2010, based on observed growth patterns and their connection to the JMA (see spatial illustration in Fig. 2). Unlike cities such as Bekasi, Depok, Tangerang, and Bogor, which have been systematically incorporated into Jakarta's urban governance structure, Karawang's growth has been driven primarily by private investment and industrial expansion rather than coordinated urban planning (Hudalah, 2015).

Fig. 1 captures the entrance to Karawang, featuring a welcome sign that reads "*Selamat Datang di Kota Karawang*" (Welcome to the City of Karawang), symbolizing the ongoing transformation in Karawang. The sign reflects how local perceptions have evolved, acknowledging the dense area after entering Karawang from the West Karawang toll gate as an urban center due to rapid industrialization, commercial expansion, and increasing residential developments. However, this urban transformation has occurred without formal metropolitan governance, leaving Karawang to navigate unregulated development, land-use challenges, and an ongoing identity crisis, despite its continued contribution to Jakarta's food supply and its evolution into an industrial center (Indraprahasta & Derudder, 2019).

This urban growth, as depicted in Fig. 2, has never been officially recognized in formal documents related to regional or national spatial planning policies (Marendraputra, 2023), resulting in governance challenges, urban identity issues, and concerns regarding infrastructure sustainability and spatial equity. The absence of formal recognition of Karawang as part of the JMA hinders the region's

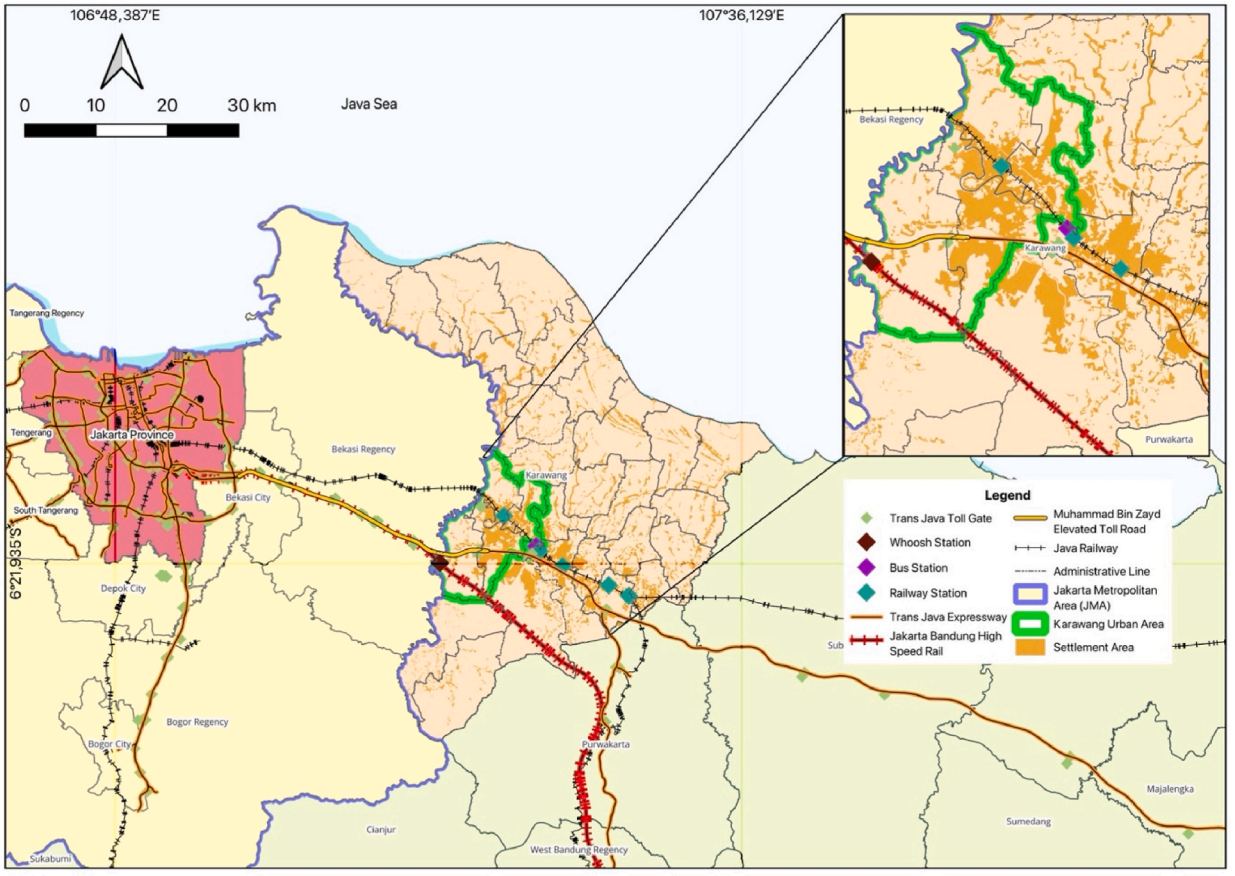

Fig. 2. Urban growth alongside the transport corridor in the Karawang urban area in 2025 Source: Author's geospatial analysis result (reproduced from OSM maps).

ability to access support and resources from Jakarta, leaving Karawang to manage its development and challenges with limited assistance from the capital, due to fragmented governance frameworks. Unregulated urban expansion and extensive land conversion cannot be hindered, ultimately creating an ongoing trilemma of identity crisis between agriculture, industry, and residential areas of Jakarta's workforce. The absence of synchronized urban planning policies has rendered Karawang highly vulnerable to speculative land development, where private investors and industries dictate land use changes without coordinated government oversight (Murtadho et al., 2020). The historical perspective on the Karawang transformation process leads to the complication of an identity crisis.

Unlike existing studies on peri-urban transformations of Jakarta in Bekasi, Bogor, and Tangerang, this study breaks new ground by focusing on Karawang, a region that has never been examined in reputable academic journals, despite its notable exclusion from Jakarta's strategic metropolitan planning and its profound exposure to mega-transport projects. Karawang's transformation is unfolding outside Jakarta's metropolitan governance structure, producing governance gaps and environmental risks that remain largely undocumented. Positioning Karawang as a case study, therefore, fills an important empirical and conceptual gap in understanding how megaprojects reshape secondary metropolitan areas in the Global South. The contribution of this study lies in (1) highlighting Karawang's trilemma and identity crisis of balancing agriculture, industry, and residential growth; (2) illustrating how transport-driven urban development often proceeds without coordinated metropolitan planning; and (3) providing insights into how similar "sacrifice zones" (Bullard, 2000) emerge in rapidly urbanizing contexts in the Global South, especially Southeast Asia.

This study is guided by three interlinked questions: How has Karawang evolved historically from an agricultural hub into an emerging urban center? What are the impacts of transport megaprojects (such as the MBZ toll road and Whoosh high-speed rail) on land use, migration, and economic activity? And how does Karawang's exclusion from Jakarta's metropolitan governance shape its urban trajectory and long-term growth prospects? Addressing these questions allows us to examine Karawang's urban transformation not only as a unique local case but also as a reflection of broader Global South patterns of uncoordinated expansion, infrastructural ambition, and governance fragmentation. In doing so, this study contributes to debates on urban sustainability, planning reform, and inclusive development, aligning with the United Nations' New Urban Agenda (2017).

The study proceeds as follows: Section Two introduces Karawang's geographic context, historical role, and evolving significance as Jakarta's hinterland, associating its precarious role as a supporting system under the constant trilemma of identity crisis. Section Three traces its development trajectory from an agricultural base to an industrial hub, identifying the complex relationships between transportation and urbanization, particularly highlighting significant gaps between the rapid transformation and establishment of MTIPs without the harmony of local and regional transportation infrastructures. Section Four examines the transformative role of transportation infrastructure, particularly the MBZ toll road, Cikampek corridor, and Whoosh rail, in driving uneven development, producing differentiated access, and generating socio-spatial exclusion. As an analytical part, this section talks about the idea of space-of-flows (Castells, 1999) that undermines how Karawang is perceived as a space where people live and connect, and urges people to engage in forms of insurgent planning and mundane activism (Kamal, 2023; Miraftab, 2009). Finally, the conclusion situates Karawang's fragmented transformation within broader debates on governance and equity in Global South cities and underscores Karawang's contradictory role as both a growth frontier and a sacrifice zone. This highlights its significance for comparative urban studies and for rethinking metropolitan governance in contexts of rapid, infrastructure-led development.

2. The reliable supporting system in A crisis of identity

Karawang's significance dates to the Pajajaran Kingdom in the 1500s, when it served as a vital transportation route connecting the northern region to the south. The Islamic kingdom attempted to incorporate Karawang to support the war against the Dutch and ultimately designated it as a "rice barn" to strengthen food supplies (Bintang, 2007). This historical event cemented Karawang's role as the primary food supply center for the surrounding area, particularly Jakarta. Since the 1600s, Karawang has emerged as the most fertile agricultural region in West Java, a leading rice-producing region with vast paddy fields spreading from the center to the northern coast and designated as a national rice barn in the West Java Province Spatial Plan (RTRW) for 2009–2029 (Murtadho et al., 2022). As of 2017, Karawang had 112,878 ha of paddy fields, accounting for 58.7 % of its total land area (Riadi & Suriadi, 2017). Even after Jakarta became the capital of Indonesia in 1945, Karawang continued to play a crucial role in supporting Jakarta's food supply. Historically, Karawang's landscape was dominated by swamps and forests, as reflected in the origin of its name, "Ke-Rawa-an," where "Rawa" means "swamp". This is evident in several districts, such as Rawamerta, which still carries the historical link to Karawang's wetlands. However, ongoing urban expansion and infrastructure development, particularly in areas along the Jakarta-Bandung corridor, have intensified land use conversion from agriculture to built-up areas. The pressure for housing, public infrastructure, and industrial expansion continues to reduce the availability of wetland agricultural areas, impacting rice production at both regional and national levels, as Karawang transforms from a mudflat to a metropolis (Bustiawan, 2023).

The strategic significance of these developments was amplified by Karawang's geographical position between Jakarta and Bandung, a mere 70 km from Jakarta. The construction of the Jakarta-Cikampek-Bandung toll road further cemented Karawang's role as an industrial hub, attracting foreign direct investment and large-scale industrial activities since 1996, and has persisted for over two decades. Karawang's rapid industrial growth has contradicted its historical image as a national rice supplier, a role that the local government had promoted until recently (Amalina et al., 2018). Over time, Karawang has undergone modernization and is now primarily known for its industrial sector. The Jakarta-Bandung conurbation process has led to increased population growth, expanded economic activity, and the rapid development of built-up areas along transport corridors (Saifullah et al., 2017). Over time, this corridor has undergone a structural transformation from rural to urban typologies (Giyarsih, 2012), resulting in high pressure on land resources and increasing potential for conflict between agricultural land and urban development. This also leads to the distortion of

economic activity and social structure across Karawang (Pravitasari et al., 2018; Sitorus, 2017).

The opening of the Jakarta-Cikampek Highway in 1988 triggered rapid economic and spatial transformations. Almost simultaneously, Kenichiro (2011) mentioned that three major development permits were issued between 1990 and 1991, leading to the establishment of three large industrial estates: Karawang International Industrial City (KIIC), Suryacipta, and Mitra, which became evidence of fast industrialization in Karawang (Tamariska, 2019). Despite promoting other sectors, the Karawang government tends to prioritize the expansion of industrial and urbanized areas, resulting in the conversion of more agricultural land. As a result, over 2500 ha of agricultural land were converted, with paddy fields declining from 95,288 ha in 1989 to 92,786 ha by 2006 (Kenichiro, 2011). The shift in Karawang's economic base was significant. Kenichiro (2011) also reported that between 1979 and 1984, agriculture contributed 44 % of the Gross Domestic Product (GDP), while manufacturing was still in its infancy. However, by 1996, manufacturing had surpassed agriculture, accounting for 33.01 % of the GDP, while agriculture dropped to 17.13 %. This trend continued, and by 2005, manufacturing had become the dominant sector, contributing 33.1 % to Karawang's economy, while agriculture's share further declined to 11.82 %.

The growth of Jakarta and increasing connectivity have been significant drivers of land conversion in Karawang. Simultaneously, the uncontrolled pressure for Karawang to develop has led to increased demands for infrastructure. The need for housing and services, including hospitals, schools, amenities, restaurants, and shopping centers, has concentrated around the urban areas of Karawang (Sipayung & Susanty, 2014). Consequently, agricultural and rice lands have experienced rapid and significant conversion. The districts with the highest land use changes included Pangkalan, Tegalwaru, Klari, Ciampel, Cikampek, Kotabaru, Telukjambe Timur, and Telukjambe Barat (Handayani, 2022), which have been almost entirely transformed into urban areas. Urbanization in Karawang Regency from 2003 to 2014 was largely concentrated in the central region, near key road networks, particularly those linking Jakarta and Bandung (Murtadho et al., 2022). This development trend has intensified economic disparities between central Karawang and its northern and southern regions, which remain largely dependent on agriculture. If this urban expansion continues, Karawang may experience further spatial inequalities, with rapid urban growth in the central corridor overshadowing the predominantly agricultural peripheries.

Karawang's transition from an agriculture-based economy to an industrial hub has also led to major social changes. Land acquisition for industrial development intensified in the early 1990s, and many local landowners willingly sold their farmland, as they perceived it as low-productive land with limited economic prospects. Wealthy villagers, who traditionally relied on water buffalo breeding and rice farming, shifted their assets into real estate, vehicles, and consumer goods, marking a significant cultural and economic transformation in Karawang's rural society (Kenichiro, 2011). In addition, many farmers have transitioned to becoming factory workers and traders to adapt to the changing circumstances. The demand for labor has been immense, but the local human resources in Karawang have been inadequate, both in terms of quantity and qualifications. The skills required for farming are not necessarily suitable for factory work. Consequently, factories have favored workers from other regions, resulting in occupational marginalization of the local population in Karawang.

Karawang primarily serves as a support for the JMA, struggling to carve out its own distinct identity separate from Jakarta. The local government is significantly influenced by the benefits that Jakarta and the national government gain from the presence of heavy industries in the region. This ongoing pressure on Karawang for agricultural land, industrial development, and residential space for Jakarta's growing population has led to disruptions in regional stability and compromised environmental sustainability (Rustiadi et al., 2021). The ecological degradation in Karawang is evident through groundwater depletion, extensive pollution, and a decline in soil quality due to relentless land expansion, which leads to an overall landscape degradation. Meanwhile, social mobility within the region remains limited (Karawang Planning and Development Agency, 2016).

The direction of Karawang's development remains unclear and represents complexity in the trilemma, whether to focus solely on the industrial sector, prioritize the revitalization of agriculture, continue to expand through the development of glamorous residential areas, particularly those emerging near the Jakarta–Cikampek toll road exit, or pursue a combination of the three. In rationale, when all sectors are maintained, the industrial sector will continue to expand under existing conditions and limited technology, while agriculture will continue to degrade and suffer from pollution. At the same time, affluent residential enclaves with superior transport access will continue to attract investment and population, growing disproportionately compared to other areas. This will reinforce existing spatial inequality, as less-connected communities are left behind in terms of services and opportunities. In response, the government has not demonstrated a clear intention to ensure a well-functioning agricultural supply chain in Karawang. Furthermore, limited media access for residents to express their opinions exacerbated these complex bureaucratic processes, especially regarding people's opinions on the direction of Karawang's development. The local government has also failed to address the potential for rapid and disorganized investments in the housing sector. Consequently, uncontrolled land-use changes rapidly occurred near the Karawang exit on the Jakarta toll road, where agricultural land has been converted into industrial and housing complexes without proper guidance and coordination. The housing complexes in the Karawang urban area are primarily occupied by residents who have businesses in Karawang or commute to work in Jakarta, while only a small portion is designated for industrial workers.

3. The uneven urban transformation from Transportation Inequality

This section emphasizes transportation network development, which has had a remarkably influential impact on the transformation of the Karawang Urban Area, while areas outside remain overlooked. Like other emerging cities in the Global South, transport infrastructure has become an essential element that influences the structure of the urban forms at the local, regional, and global levels (Parikesit, 2008; Rodrigue, 2020), particularly in the urbanization process (Aljoufie et al., 2012; Arvin et al., 2015; Motamed et al., 2014; Zenou, 2010). During President Jokowi's government (2014–2024), infrastructure development, including

seaports and airports, roads and toll roads, and power plants, became key pillars in aiming connectivity improvement between growth centers and peripheries, also among islands in Indonesia (Roitman & Rukmana, 2022). The infrastructure projects were part of the past President Yudhoyono's Master Plan for the Acceleration and Expansion of Indonesian Economic Development (MP3EI, 2011–2025) (Davidson, 2016). However, President Jokowi demonstrated a more aggressive commitment by emphasizing infrastructure development as a key strategy to address inequality, in addition to implementing deregulation and de-bureaucratization programs (Guild, 2019; Warburton, 2018). Approximately $23.9 billion (Rp 290 trillion) was allocated for infrastructure projects (by reducing fuel subsidies before), an increase of 86 % on the previous government's budget allocation (Davidson, 2016; Guild, 2019).

The MBZ elevated toll road, Trans Java toll road (including Jakarta-Cikampek toll road), and the Whoosh are included in the MTIP as part of President Jokowi's plan to improve the country's transportation network, aiming to help boost the economy by easing the mobility of people, goods, and money around Java, the most populous island in Indonesia (Suprayoga & N, 2025). While these projects promise to enhance economic connections and promote growth, most of them exhibit a top-down approach where large-scale state and corporate interests are dominant, while local stakeholders, including residents, small-scale farmers, and local governments, are sidelined (Winch, 2017).

As reported in Warsono (2019), the MBZ expressway, stretching 36.8 km along the Trans-Asian Highway corridor, was constructed for USD 1.12 billion and officially opened in 2019 to alleviate congestion on the Jakarta-Cikampek corridor. While it has facilitated over 437,000 vehicle trips per day, the surrounding municipalities were underprepared to harness its full economic potential. Instead, property development surged around toll gates, fueling rapid land value increases and encouraging the rise of gated, exclusive residential enclaves (Suprayoga & N, 2025). These developments were primarily aimed at Jakarta-bound commuters, displaced preserved agricultural zones, and marginalized local populations, many of whom were forced to shift occupations and adapt to a speculative urban economy (Silver, 2007). Such outcomes mirror broader criticisms that megaprojects fail to integrate sectoral interdependencies, particularly those concerning agriculture, housing, and civic equity (Suprayoga & N, 2025). Chronologically, the MBZ road was completed *after* early industrial parks, such as KIIC, had begun expanding, suggesting its initial role was to respond to rising demand. Yet, significant acceleration of new projects was reported between 2020 and 2023, including 105 ha industrial land expansion (which was directly linked to access improvements from MBZ in 2021 and completed early 2023) and 103 ha Parkland Podomoro township (launched August 2023, citing MBZ access as a key selling point) (Agung Podomoro Land, 2023; Ithochu Corporation, 2021). This supports the notion of a hybrid effect: MBZ partly followed existing growth but also stimulated further development, especially in residential and industrial sectors that emerged after its opening.

The establishment of the 36.4 km MBZ Elevated Toll Road and the operation of the Whoosh have put Karawang at strategic nodes in Indonesia's transport network. The MBZ elevated toll road has drastically reduced travel time between Jakarta and Karawang, making the city more attractive for commuters, investors, and developers. Similarly, the operation of Karawang Station as an intermediate station on the Whoosh high-speed rail was expected to increase commuter flows, boost land values, encourage migration, and stimulate commercial expansion from the JMA (JICA, 2015). The introduction of Whoosh as a rail-based transport system is expected to serve as a high-capacity and high-quality public transportation mode, becoming a backbone of the intermodal system (Parikesit, 2008). In the case of the Whoosh project, building the railway required changing over 800 ha of farmland, which affected nearly 1000 families. As a result, local governments had to quickly update their plans to adapt to these changes. Unfortunately, these updates often focus more on justifying the project rather than shaping it in a way that benefits everyone involved. This situation highlights the disconnect between the country's ambitious goals and the actual needs of local communities (Suprayoga & N, 2025).

Meanwhile, within Karawang, to provide transportation infrastructure for local citizens, Karawang has attempted to establish a local transport network that includes four main bus terminals: Klari, Cikampek, Rengasdengklok, and Tanjungpura. Additionally, 18 public transport routes operated in 2021, with 200 transport vehicles recorded in 2023, serving daily commuters and intra-city travelers (Communication and Informatics Department of Karawang Regency, 2022). Karawang also has one regional railway station, where five train services stop, connecting it to other urban centers (Karawang Regency, 2019). Furthermore, the Whoosh station in Karawang strengthens connectivity with Jakarta and Bandung, potentially influencing commuting patterns and economic activity.

However, despite the availability of public transport, private vehicle usage remains dominant, highlighting the limitations and ineffectiveness of the existing system. Data from BPS - Statistics of Karawang Regency (2024) in Table 1 shows a steady increase in registered motor vehicles in Karawang from 2018 to 2023. Passengers rose from 76,308 in 2018 to 103,647 in 2023, and motorcycles increased from 755,961 to 761,919 over the same period. The high dependency on road-based vehicles, particularly private cars and motorcycles, indicates that public transport options remains insufficient to meet the growing demand, necessitating further improvements in accessibility, coverage, and service efficiency. The increasing number of private vehicles also aligns with traffic congestion, air pollution, and road infrastructure demands, emphasizing the need for a more integrated and sustainable transport

Table 1
Number of registered motor vehicles in Karawang (2019–2024).

Year	Passenger cars	Bus	Truck	Motorcycle
2018	76308	1385	29884	755961
2019	84877	1387	30635	769717
2020	85658	1407	29211	733854
2021	89817	1375	29152	733791
2022	95760	1382	30066	738650
2023	103647	1441	30648	761919

Source: BPS - Statistics of Karawang Regency (2024).

policy that balances public and private mobility needs.

Solely focusing on transport infrastructure in Karawang's urban area while neglecting surrounding regions underscores the unequal accessibility of transportation, which resulted from transportation planning processes that place unfair weight on the preferences of more advantaged members of society (Bills & Walker, 2017). Current transport practices promote automobile dependency and urban sprawl, easing car travel but restraining the use of other modes. This results in inequitable access, especially for people living in poverty, to meet their daily needs and live a dignified, fulfilling life due to a lack of access to essential services and opportunities (Karner et al., 2024). Automobiles demand more space and energy, leading to increased external costs, such as infrastructure subsidies, traffic congestion, and pollution. While cars may be affordable for many, their associated infrastructure often displaces and harms vulnerable communities (Litman, 2025). Ensuring equal access for all social groups, particularly in accessing basic needs, is crucial for enhancing public policy and infrastructure, even if it is often not economically efficient (Geurs et al., 2016).

Transportation and urbanization have a complex and non-linear relationship. Liu et al. (2019) highlight that transportation infrastructure positively impacts urbanization in the short term by reducing commuting costs and attracting population movement. Additionally, transportation catalyzes urbanization by promoting economic specialization and enhancing labor mobility, which eventually leads to economies of scale and industrial agglomeration (Chai et al., 2016). Dingil et al. (2021) also highlight that land use and transport infrastructure are the two main features that shape the urban form. This has been evident in Karawang, where transport infrastructure, particularly the MBZ elevated toll road, has facilitated land conversion, commercial expansion, and shifts in migration patterns, despite the absence of direct metropolitan planning integration. The MBZ elevated toll road, which closely follows existing development (industrial and residential) corridors and primarily serves private vehicle users and freight logistics, reinforces car dependency. In contrast, the Whoosh high-speed rail station is situated in a less dense, peripheral area, where surrounding development remains limited and largely speculative. Rather than responding to current population pressure, the station appears to stimulate future-oriented land value expectations. These contrasting roles illustrate how infrastructure can shape urbanization through both reactive and anticipatory mechanisms. These two projects also have distinct equity and sustainability implications: the toll road may deepen auto-oriented exclusion, and the HSR has the potential to promote more sustainable urban forms, if integrated with inclusive public transport and affordable access. Recognizing these differences is essential to understanding how infrastructure shapes spatial transformation and who ultimately benefits. In the long term, urbanization requires further transport expansion to sustain economic growth and spatial development (Liu et al., 2019).

The growth of motorization, industrial expansion, and economic activity in Karawang mirrors global urbanization trends, where increased accessibility fuels higher real estate demand, migration patterns, and industrial development (B. Lin & Du, 2015; Mu et al., 2009). It is worth noting that as urbanization progresses, mobility demand also evolves. Without proper transportation planning, this early and unregulated urbanization can lead to social and economic consequences, including worsening congestion, pollution, and infrastructure vulnerability (Ahmad & Puppim de Oliveira, 2016; Ahmed et al., 2008; Motamed et al., 2014). Currently, the urban area of Karawang is categorized as a small developing city that struggles with the institutional capacity to manage its rapidly growing population (Pojani & Stead, 2015), particularly where the city has fewer resources to implement necessary transportation infrastructure and may be more vulnerable to fluctuations in the world economy and the impacts of climate change. This impact may arise from the inappropriate policy timing of the transport network system, which should consider factors such as income level, population, car ownership rate, and demand density when determining the optimal time for construction (Parikesit, 2008). Preventing that consequence in Karawang requires not just expanded infrastructure but also a shift toward sustainable transport solutions. Transport networks should therefore be designed to support long-term urban resilience, ensuring that investments in connectivity align with sustainable development goals. While improved connectivity is crucial for urban expansion, it also presents financial and environmental challenges that must be managed responsibly. It is essential to prioritize transport design that centers on people, where the importance of safety, urban liveliness, and personal well-being outweighs corporate efficiency in enhancing connectivity for growing cities (either in population size or urban form) (Prevc, 2017).

4. Exclusive urbanization and the compression of space-time

In line with Martinez and Masron (2020) argument of Jakarta as a city undergoing endless transformation, Karawang has similarly experienced continuous and rapid changes over time. As a largely overlooked supporting region, Karawang's trajectory has become closely intertwined with Jakarta's mega-urbanization (Hudalah, 2015). Karawang evolved organically from a loyal supporting region into an area deeply influenced by Jakarta's growth, reflecting both multiplier effects and externalities. Historically, expansion near Karawang's toll exit catalyzed the city's development, yet this was driven more by social and economic factors than official planning. Indeed, Karawang's persistent absence from official planning documents on Jakarta's affected areas (Hudalah et al., 2024) has consistently deprived it of formal support from higher administrative authorities, placing substantial limitations on local budgeting and policy implementation.

The development of the JMA, especially through extensive regional transportation infrastructure such as the MBZ elevated toll road, Whoosh, and the Cikampek toll road, has had a significant impact on Karawang. Notably, these infrastructure projects have accelerated Karawang's urban transformation, stimulating economic growth through manufacturing, industrial activities, and enhanced commercial facilities. With travel times reduced to less than 10 min from Halim Station (the central and notoriously congested Whoosh starting station in Jakarta), Karawang has increasingly become an attractive location for mid-to upper-income migrant workers commuting to Jakarta, solidifying its role as a residential support region for the metropolitan area. Rodrigue (2020) explained that transport network improvements, which involve easier, faster, and cheaper access between places, can lead to a significant increase in accessible locations due to space-time convergence.

The area around the toll gate exit, particularly, serves as a major focal point of urban activity. With an estimated population of 2.5 million people in 2023 and an annual growth rate of 1.8 % (BPS - Statistics of Karawang Regency, 2024), demand for housing, transport, and services continues to rise. Particularly, the Karawang Urban Area has become an alternative residential area for workers who commute to Jakarta, benefiting from lower living costs and increased job opportunities (Marendraputra, 2023). The Cipularang Toll Road (Cikampek-Purwakarta-Padalarang), which connects Jakarta and Bandung, passes through Karawang, making it a critical urban expansion zone (Murtadho et al., 2020, 2022). The urban areas alongside Highway Street (see Fig. 2) exhibit the footprints of poor housing development, gated communities, and high-density residential projects (Firman & Fahmi, 2017). The housing complex distribution data within Karawang as shown in Fig. 3 provides strong evidence that housing cluster concentration is influenced by accessibility to major transportation nodes. Kota Baru leads with 67 housing complexes, followed closely by East Karawang with 58, Klari and Purwasari each with 54, and East Telukjambe with 26 housing complexes. Those districts have high accessibility to the major transportation network. Conversely, the remaining districts exhibit minimal to no significant housing development, reflecting a clear spatial disparity shaped by transport-driven connectivity.

The growth of residential areas has been accompanied by significant commercial expansion, predominantly within the same urbanized districts, illustrating a coordinated market-driven spatial transformation. From Fig. 3, West Karawang, despite having fewer residential clusters (25 complexes), has become a commercial focal point with prominent establishments, including Resinda Park Mall, Yogya Grand, Ciplaz Karawang, and Indogrosir. Similarly, East Telukjambe aligns residential expansion with significant commercial activity through major shopping centers, such as Karawang Central Plaza, Festive Walk Mall, and Technomart Galuh Mas, reinforcing its status as a multifunctional urban district. Meanwhile, East Karawang complements its residential density by hosting commercial hubs such as Summarecon Mall Karawang, Lotte Grosir Karawang, Pasar Kondang Jaya, and Ruko Klari Indah, reflecting a holistic urban growth pattern driven by proximity to major transportation routes and nodes.

By hosting the Karawang governmental complex, major commercial centers such as Resinda Park Mall and Summarecon Mall as well as upscale facilities, including residential neighborhoods, open spaces, sports arenas, and educational facilities, Karawang Urban Area shows remarkable development compared to other areas due to transport improvement. As aligned with (Rodrigue, 2020), a region with greater mobility than other areas with scarce mobility, indicating better development opportunities. However, this transformation was largely shaped by market speculation and private real estate investment, rather than coordinated urban planning. According to Suprayoga and N (2025) the MTIP projects mainly focus on the idea of "space-of-flows," which essentially defines cities as places for moving money and goods rather than as homes where people live and connect (Castells, 1999). Consequently, Karawang Urban Area has evolved into a glamorous area characterized by luxurious developments that primarily benefit wealthier individuals while remaining fundamentally tied to Jakarta as a dormitory city.

Nevertheless, the benefits observed are considerably constrained in their geographical spread, which restricts the progress of other areas with sluggish movement, resulting in adverse spatial inequality. Furthermore, it can lead to separation within the city, the loss of agricultural land, and infrastructure development that is mismatched with actual community needs (Silver, 2007). The economic benefits and formal urban infrastructure developments have predominantly concentrated in the four key districts aforementioned, closely aligned with major transport nodes. Residential clusters and major commercial facilities such as Festive Walk Mall and Technomart Galuh Mas are also concentrated here, leaving other districts significantly underserved and marginalized from these developmental advantages. This spatial inequality is aligned with Rodrigue (2020), the infrastructure development (including transportation network) will not be laid out uniformly, so the space-time convergence will not occur ubiquitously. Over time, some locations gain more accessibility than others, particularly if they experience the accumulation of transport infrastructures and have a level of economic and political influence.

Beyond the formal and prosperous districts, particularly in the southwest and southern parts of Karawang, informal settlements and vulnerable socio-economic conditions persist. Communities such as those in Karangligar, West Telukjambe, exemplify acute vulnerabilities, characterized by frequent flooding, low-income levels, and limited access to essential services and infrastructure

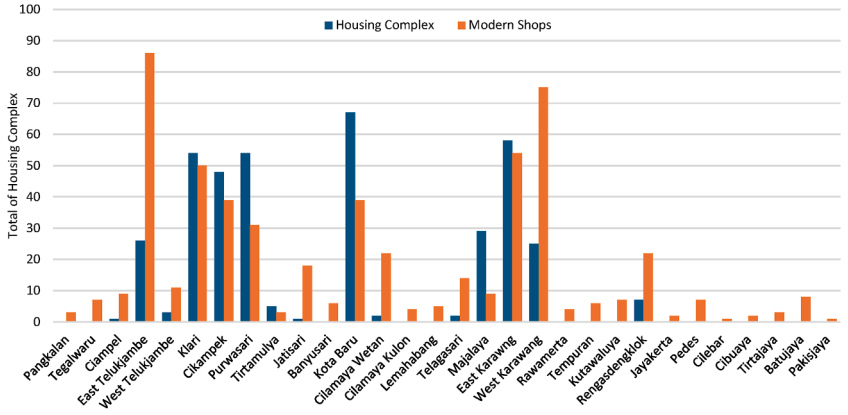

Fig. 3. Housing complex and modern shops distribution in Karawang source (BPS - Statistics of Karawang Regency, 2024; Department of Public Housing and Residential Areas of Karawang Regency, 2022).

(Marendraputra, 2023). Residents of these marginalized areas engage in forms of insurgent planning (Miraftab, 2009), and mundane activism (Kamal, 2023), employing collective resource management and informal economic practices for resilience and survival. Although the transport network connects key urban nodes, its benefits are primarily concentrated in these selected areas, providing a temporary rather than a comprehensive solution to broader regional issues in mega-urban areas.

Social disparities are also observed in the equity of transportation utilization. While transport improvements have transformed urban areas, Karawang lacks equitable public transportation access to all regions of Karawang. Higher income levels are typically associated with a higher share of transportation consumption, particularly in private vehicles, as mobility often becomes a symbol of social status (Rodrigue, 2020). This reinforces the dominance of cars and motorcycles, especially within the Karawang Urban Area, where rising income often stimulates the desire for more comfortable, convenient, and flexible personal vehicles (automobiles and motorcycles) (Ahmed et al., 2008). Meanwhile, lower-income communities, especially those in peripheral neighborhoods, face higher barriers. These areas often lack access to basic services such as affordable groceries, healthcare, and due to limited transport options, residents end up paying more for goods and having fewer job opportunities (Rodrigue, 2020). Employment Centers located in sub-urban or industrial zones are designed for car users, further disadvantaging those who cannot afford a private vehicle. Without comprehensive and inclusive transport planning, private vehicles remain dominant, worsening social inequity, and creating environmental and infrastructural strain. The lack of affordability and accessibility to adequate transportation systems further intensifies social exclusion (Kenyon et al., 2002). Ahmed et al. (2008) highlight that while transportation infrastructure modernization is vital for economic development, it must not neglect social equity and environmental sustainability. They strongly criticize that planners for often pursuing glamorous projects without adequately considering local circumstances and long-term impacts. The city expansion that ignores people's quality of life inevitably creates social segregation (Prevc, 2017), prioritizing the wealthy group while neglecting those who prefer walking, biking, and conventional transit systems, thus failing to fulfill the sustainable and equitable transportation standard (Ahmed et al., 2008).

5. Conclusion

This study aimed to investigate how Karawang's transformation has been influenced by megaproject-driven urbanism, with the primary objective of understanding how transport-led expansion affects land use, governance, and social dynamics in peri-urban regions beyond Jakarta. The findings demonstrate that while infrastructure projects such as the MBZ toll road and Whoosh HSR enhance connectivity, they also deepen inequalities due to fragmented governance and a lack of integration with local planning. This directly addresses the study's objective of identifying Karawang's uneven urban transformation and its implications for sustainable urban futures.

Karawang presents a compelling example of how transport-driven urban transformation in the Global South can lead to uneven and often fragile outcomes. While infrastructure-led development, such as megaprojects like the MBZ toll road and the Jakarta–Bandung high-speed rail, has improved connectivity and spurred land-use changes in specific urban centers, this transformation remains highly uneven. This infrastructure-led growth fosters glamorous residential enclaves for the affluent while reinforcing transport inequality, where residents in other districts remain heavily dependent on private vehicles and lack adequate public transportation options. This situation reflects a growing problem of transportation disservice and accessibility poverty, where individuals are unable to meet their daily needs or live a dignified life due to poor access to essential services and economic opportunities.

The findings reveal that Karawang exemplifies the precarious trajectory of transport-driven urbanism in the Global South. Spatially, the concentration of investment in high-value areas marginalizes peripheral districts; economically, speculative land practices inflate values and displace traditional uses; socially, unequal access to transport creates conditions of “accessibility poverty,” where residents are unable to meet daily needs or participate fully in urban life. Karawang's transformation underlines how infrastructure expansion, when not coordinated with inclusive spatial planning, deepens inequality rather than resolving it.

Karawang's unresolved trilemma, balancing agriculture, industry, and residential growth, underscores the governance gaps that emerge when local planning is subordinated to national megaproject agendas. The government's limited coordination across sectors and administrative levels further complicates these competing roles. Indonesia's planning culture starkly contrasts with the strategic, infrastructure-oriented urban development seen in cities like Singapore (Connolly & Muzaini, 2022). Karawang exemplifies how peri-urban regions in the Global South expand through market-driven property speculation, fragmented urban planning, and complex political-economic contexts (Follmann et al., 2023). Its development trajectory offers a distinctive lens through which to examine the persistent identity crises triggered by uncertainties stemming from mega-urban expansions and their demands on peri-urban support systems. Within this framework, Karawang has emerged as a sacrifice zone (Bullard, 2000), continually absorbing the environmental and social costs of Jakarta's growth while receiving minimal formal recognition and resources.

Although still unrealistic under this current situation, a more positive change in the future is necessary. Addressing these disparities requires an inclusive and equitable spatial plan, particularly in transportation planning to integrate all districts of Karawang to emphasize equity, safety, and environmental sustainability rather than purely market-driven criteria. Achieving greater connectivity through equitable mobility and comprehensive infrastructure distribution produces more cohesive communities with better social ties and economic prospects (Arvin et al., 2015; Prevc, 2017). Furthermore, to the best future scenario of the majority of the Global South, promoting cities with well-integrated transport networks that encourage walking, cycling, and the use of public transit while reducing automobile dependence can ensure urbanization and enhanced connectivity benefits are broadly accessible, avoiding the creation of ‘sacrifice zones' where marginalized communities bear disproportionate environmental and social burdens (Ahmad & Puppim de Oliveira, 2016; Arvin et al., 2015; Lehmann, 2011). Ensuring long-term resilience in Karawang depends on aligning infrastructure investments with sustainable development goals, promoting a planning culture genuinely centered on community needs, and equitable

urban growth.

Ultimately, the case of Karawang illustrates both the opportunities and perils of infrastructure-led development. Whether it becomes a model of equitable integration or remains an overlooked periphery burdened by Jakarta's expansion is an open question. By centering a city often absent from metropolitan planning debates, this study makes an original empirical and conceptual contribution. It reframes Karawang as a critical site through which to interrogate the uneven, uncertain, and contested pathways of urban transformation in Southeast Asia. Most importantly, to underscore the importance of seeing the second-layer city of the megapolitan of Jakarta, to scrutinize the city that has been influential to this capital for centuries, since the pre-colonial era of Indonesia. Despite its contributions, this study is constrained by certain limitations, primarily its reliance on secondary data and its largely descriptive approach. To enhance robustness and provide deeper insights, future studies should incorporate household-level surveys and quantitative land-use modeling to validate the observed dynamics and situate them within a more thorough context of the case study. Furthermore, while Karawang's case may not be fully generalizable to other peri-urban regions, it nonetheless offers a critical lens through which to understand the uneven transformations and governance challenges emerging in rapidly urbanizing corridors of the Global South.

CRediT authorship contribution statement

Priza Marendraputra: Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Methodology, Formal analysis, Data curation, Conceptualization. **Hana Afifah Amini:** Writing – review & editing, Visualization, Validation, Methodology, Data curation.

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Declaration of interest statement

The authors declare no conflicts of interest associated with this manuscript.

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