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PART 1: Spatial Analysis and Cities Benchmarking

by Dr. Ahmad Farhan Roslan, Adibah Amira Nazarudin,
Fakhira Fathini Mohd Khudzari, Muhammad Azizol Ismail



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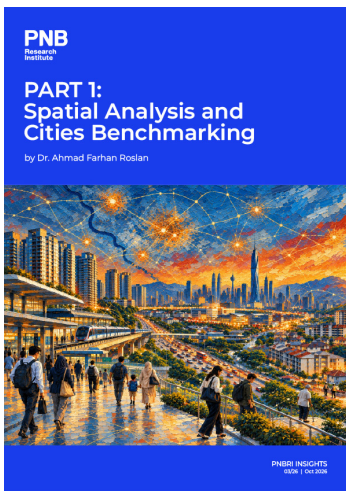
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Executive Summary

Malaysia's urban future will be defined not only by how much cities grow, but also by how people, jobs, and economic activities are distributed across the country. Despite decades of national spatial-planning efforts to promote balanced territorial development through a series of Malaysia Plans, growth continues to expand and concentrate in a small number of metropolitan areas. Poorly organised urban expansion has led to congestion, infrastructure strain, spatial inequality, and rising climate risk. There is a strong case in policy and academic research that sustainable urbanisation depends not only on the extent of urban expansion but also on how that expansion has unfolded spatially, through patterns of agglomeration (concentration) and dispersion (spread).

This report examines these patterns across Malaysia's key metropolitan regions and complements this analysis by systematically benchmarking global cities to contextualise Malaysia's performance and identify policy-relevant lessons, combining:

- **Diagnosing spatial changes** using satellite Night-Time Lights (NTL) data to track urban expansion patterns;
- **Thematic analyses** of credible literature identifying factors of agglomeration and dispersion; and
- **Benchmarking** exercise against major global cities across different urbanisation stages.

A central finding of this report is that urban spatial outcomes are not determined primarily by planning intent alone. Instead, they emerge from how households, firms, and institutions respond to economic opportunities, housing affordability, accessibility, infrastructure provision, and governance arrangements. As major urban centres become increasingly congested and costly, development disperses into surrounding corridors and secondary centres, creating new polycentric urban structures.

Globally, national urban policy has shifted from simply encouraging urbanisation to ensuring **spatially efficient, inclusive, and resilient urban forms**, frequently through polycentric systems that balance core cities with strong secondary centres. Several cities globally are currently implementing polycentric networks of secondary and prominent towns to balance the benefits of agglomeration with the risks of congestion and urban sprawl.

In Malaysia, planning practice recognises a five-level urban hierarchy under the National Urban Policy (NUP), from metropolitan areas to local towns, to promote balanced development. However, in practice:

- Major metropolitan areas still capture a disproportionate share of the population and investments.
- Imbalance puts pressure on housing, transport, and infrastructure in those major metropolitan areas, while peri-urban corridors expand rapidly with limited public services.

To diagnose spatial changes, the report uses satellite NTL data from VIIRS DNB, processed into annual composites and classified in the HSV colour space into High, Medium, Low, and Dark intensity categories. The metrics include intensity shares and 8-connected cluster morphology (cluster counts, largest cluster size, average size). This provides a consistent, comparable lens on urban brightness as a proxy for population, economic activity, and power consumption. The NTL analysis results indicate that:

- Urban expansion is increasingly dispersed along transport corridors
- Growth is spreading into multiple nodes beyond the core
- Major cities are shifting towards a polycentric spatial form

However, the balance between core intensification and peri-urban dispersion varies by region, raising distinct challenges for transport, housing, land-use control, and climate resilience. At the same time, a thematic synthesis of 45 studies identifies eight interacting themes that shape agglomeration and dispersion. These themes offer a diagnostic lens to move beyond symptoms and address the underlying causes of urban form, which is vital for designing effective interventions.

A benchmarking chapter further compares the performance of other metropolitan regions across selected indicators, assesses alignment with policy objectives, and identifies priority interventions. Using a lifecycle-based diagnostic framework, the chapter analyses performance as archetypes of four stages (Embryonic, Acceleration, De-acceleration, and Approach Zero) and finds that dispersion is not inherently automatic but must be actively engineered through polycentric development, transit development, and urban regeneration.

The cities' benchmarking analysis shows that these cities actively manage the transition from concentrated growth to more integrated polycentric systems. Experiences in Seoul, Tokyo, Bangkok, Jakarta, New York, and Tampere show that unmanaged dispersion often leads to congestion, fragmentation, and environmental stress. In contrast, well-planned polycentric development can sustain productivity while improving resilience and quality of life.

In summary, the report finds that Malaysia’s urban development has been primarily driven by strong agglomeration forces, making balanced territorial development challenging to achieve in practice.

Evidence indicates that polycentric urban systems and secondary cities emerge naturally as adaptive responses to congestion and capacity limitations in dominant cities, where productivity gains are realised through “scale borrowing” when sub-centres are well connected to core areas. International experience highlights the risks of reactive, crisis-driven dispersion and the advantages of proactively managed polycentric planning.

Overall, the report concludes that the policy challenge is no longer how to redistribute growth evenly across the territory, but how to manage and connect an increasingly polycentric urban system. Future urban policy should therefore shift from pursuing balanced territorial development towards functional polycentricity, in which cities and secondary centres are linked through stronger economic, transport, institutional, and governance networks.

These findings suggest that Malaysia's urban development is driven by concentrated structures, emerging but uneven polycentric growth, and inefficiencies in spatial utilisation.

Some of the **key findings** highlight:

- Household and firm decisions reflect behavioural responses to affordability, accessibility, and opportunity, and shape spatial outcomes more than policy intent
- Major metropolitan areas continue to dominate economic activity, showing strong underlying agglomeration forces.
- Secondary cities are emerging but remain weakly integrated and dependent on dominant urban centres
- Urban growth accelerates, expanding along corridors or following transport networks rather than through spatial planning
- A mismatch between supply and demand shows that physical expansion does not consistently translate into economic utilisation, leading to underused areas alongside congested cores
- Current pattern reflects an adaptive response to system pressure rather than deliberate policy design

To address the above, policy recommendations are needed to strengthen system integration, improve connectivity, and better align urban development with economic functions. The report's recommendations include:

- **Shift towards functional polycentricity**. Transition from redistributing growth to building integrated networks of interdependent urban centres
- **Strengthen connectivity across nodes.** Align transport and infrastructure with commuting flows and economic linkages to enable functional integration
- **Optimise existing urban assets.** Prioritise infill development, redevelopment, and better utilisation of existing spaces before expansion
- **Align jobs, housing, and mobility systems.** Improve coordination across land use, transport, and economic planning to reduce inefficiencies and congestion
- **Enhance economic–spatial coordination**. Support complementary roles among cities and enable "scale borrowing" through stronger inter-city linkages
- **Strengthen metropolitan governance.** Move beyond administrative boundaries towards coordinated planning at the functional urban region level
- **Adopt behaviour-informed and anticipatory planning.** Use data, incentives, and forward-looking tools to shape urban outcomes rather than reacting to them.

Objective

This paper is the first part of a larger research track by the PNB Research Institute ("PNBRI") that aims to better understand the characteristics of "future cities" and the reconfiguration of urban systems in the Malaysian metropolitan region. The goal is to provide decision-makers with a strong basis for developing inclusive, sustainable and resilient urban development strategies.

This work addresses the pressing issue of urban stagnation in Malaysian cities, where declining vibrancy, outward sprawl, and rising spatial inequality threaten long-term competitiveness and livability. To understand how and why these challenges emerged, this paper examines the key factors influencing urbanisation patterns, be it agglomeration or dispersion, and how these dynamics are reshaping metropolitan development trajectories in Malaysia. Project URBAN aims to inform more integrated and forward-looking approaches to urban policy, supporting the repositioning of Malaysian metropolitan regions towards greater competitiveness, inclusivity, and long-term sustainability.

To achieve this, Project URBAN is organised into **four complementary workstreams**, each with specific objectives:

- **Spatial analysis and cities benchmarking report.** To establish the strategic context for Malaysia's urban transition by benchmarking Malaysian cities against global urban trajectories, identifying performance gaps, emerging trends, and policy-relevant lessons.
- **Urban form and spatial analysis report.** To diagnose patterns of urban growth and transformation by examining how agglomeration, dispersion, and emerging polycentric structures are reshaping Malaysian metropolitan regions.
- **Urban living lab.** To understand how behavioural responses, lived experiences, and decision-making by households, firms, and stakeholders influence urban outcomes and shape city development beyond planning intent.
- **Flagship report.** To integrate findings from all workstreams into a coherent framework that informs policy and strategic decision-making for future urban development in Malaysia.

Together, these workstreams provide a structured pathway to understand where Malaysian cities are today, how they are changing, the factors driving those changes, and the policy interventions needed to support more competitive, inclusive, and resilient urban systems.

Chapter 1: Background and Policy Analysis

Analysing patterns of urban agglomeration and dispersion is critical, as they shape how countries envision their urban development strategies and address urban challenges. Globally, urbanisation is accelerating, with the United Nations projecting that by 2050, more than 68% of the world's population will live in cities (United Nations, 2018). This reflects cities' role as engines of economic growth, innovation, and social development. Cities worldwide account for over 80% of global GDP (UN-Habitat & OECD, 2024), making them crucial to economic activity and social progress. However, rapid and poorly managed urbanisation can lead to congestion, sprawl, pollution, housing stress, and infrastructure strain.

Agglomeration and dispersion are key concepts in urban economics and geography. **Agglomeration** refers to the spatial concentration of firms, workers, and economic activities, and production factors within a specific geographic location (Jiang et al., 2025; Vang et al., 2025). Agglomeration has several positive effects, including increased productivity through spatial proximity, which provides better access to specialised suppliers, labour market pooling, and markets. It also lets firms share infrastructure and services, reducing operational and transportation costs. Moreover, agglomeration promotes knowledge spillovers, innovation, and specialisation, as interactions between firms and workers encourage the exchange of skills and ideas.

Despite its benefits, excessive agglomeration often leads to congestion, overcrowding, and increased pressure on infrastructure and public services. Agglomeration may also create uneven regional development when economic activity becomes overly concentrated in a specific area. As excessive agglomeration generates diseconomies, including rising land and housing costs, congestion, and environmental pressures, population and economic activities may decentralise from urban cores, pushing the population outward from concentrated, compact patterns towards **dispersion** (Dadashpoor & Malekzadeh, 2020; Strano et al., 2021). Dispersion refers to redistributing settlements and activities across a wider territory, reducing spatial concentration in a single core while strengthening the role of secondary centres.

Managing dispersion, such as creating a polycentric[1] urban system with growth distributed across interconnected metropolitan and secondary cities, can improve regional productivity and spatial balance without undermining agglomeration economies (Duranton & Puga, 2003; OECD, 2025). However, dispersion, if not managed properly, leads to urban sprawl, often associated with higher infrastructure development costs, longer travel distances, greater car dependence, and efficiency losses in urban services (Siedentop & Fina, 2010). These diverse impacts of agglomeration and dispersion underscore the importance of how cities and regions are planned and governed, which, in turn, will shape sustainable and balanced urban development.

1 **Polycentric** is defined as a collection of historically distinct and both administratively and politically independent cities located in close proximity, well connected through infrastructure, commuting and business linkages and clustered together as a single economic functional area

The following policy analysis provides background to contextualise global urbanisation trends and examines how both national and international frameworks address urban agglomeration and dispersion.

Global insights into urban agglomeration and dispersion

The Global State of National Urban Policy 2024[2] highlights how unbalanced urbanisation can have more negative impacts than benefits. From a policy standpoint, the concern has shifted from "increased urbanisation" to assessing whether existing patterns of concentration and dispersion are **spatially efficient,** socially inclusive, and fiscally sustainable. The report shows that 58% of countries' National Urban Policies (NUPs)[3] focus on promoting more **balanced and polycentric urbanisation.** This signals that governments are increasingly concerned about the distribution of agglomeration **across a "system of cities",** including secondary and smaller urban centres and their surrounding rural regions.

The discussion of agglomeration and dispersion is not new; the UN's New Urban Agenda (NUA) also highlighted it, calling on countries to "leverage the agglomeration benefits of well-planned urbanisation" while "managing urban shrinking" (United Nations, 2016). It calls for **urban spatial frameworks** that promote compactness, appropriate density, polycentrism, and mixed uses to capitalise on economies of scale and agglomeration, while also warning against uncontrolled urban sprawl and marginalisation. This frame places the **spatial pattern** of urban growth, with people, firms, and infrastructure concentrated or dispersed, at the centre of sustainable urbanisation strategies.

In addition, cities that concentrate millions of people and essential infrastructure, such as transport systems, healthcare, and energy, in a single location are also becoming increasingly vulnerable to climate-related risks. According to the World Cities Report 2024: Cities and Climate Action (UN-Habitat, 2024), climate change effects such as flooding, extreme heat, and sea-level rise disproportionately affect densely populated urban areas. For example, coastal megacities such as Jakarta, Lagos, Miami, and Alexandria face existential threats from rising seas, while inland cities contend with heat stress and water scarcity. These risks emphasise the importance of **spatial planning** that not only maximises economic efficiency but also enhances resilience.

There is a strong policy argument that sustainable urbanisation depends not only on the extent of urban growth but also on how that growth is organised spatially through agglomeration and dispersion. The following are key insights from global policy documents and frameworks that explain why the spatial patterns of agglomeration and dispersion have become a central concern in urban policy.

- **Cities grow in patterns, and these patterns matter.** Urban form is not neutral, as the way

2 **The Global State of National Urban Policy 2024** is the result of analysing policies across 78 countries worldwide to manage urban challenges and promote sustainable urbanisation.

3 **NUP** is defined as "a coherent set of decisions through a deliberate government-led process of coordinating and rallying various actors towards a common vision and goal that will promote more transformative, productive, inclusive, and resilient urban development for the long term."(UN-Habitat & OECD, 2024)

density, land use, and connectivity are organised influences how people and firms interact with urban space and directly affects spatial equality and access to economic opportunities. Global variations in urban form, as studied by Chen et al. (2025), revealed that cities do, in fact, exhibit recognisable, recurring spatial patterns shaped by a combination of factors, including geographic location, population dynamics, and economic development.

- **Good planning can turn agglomeration into an advantage.** Urban policy should not only accommodate urbanisation but also strategically shape urban growth, ensuring agglomerations develop in compact, well-connected, and spatially balanced ways. According to studies by Jiang et al., (2025) and Vang et al., (2025), agglomeration becomes advantageous when firms and cities share agglomeration economies rather than concentrating them among a few winners. Strong regional specialisation is key when spatial concentration aligns with the region's sectoral strengths, specialised labour pools, and institutional support.

- **Dispersion and urban sprawl are emerging challenges.** Agglomerated urban areas that expand outward continuously push growth to urban fringes. The trade-off is that unless this fringe growth is structured into compact, well-connected sub-centres, it tends to produce scattered sprawl with higher infrastructure and service-delivery costs, greater land consumption, and spatial inequality (Bhanjee & Zhang, 2021; Litman, 2015; Trubka et al., 2010). In contrast, European countries and the OECD policy framework have promoted polycentric urban development, where peri-urban towns function as strong, transit-served sub-centres that combine the benefits of agglomeration with more balanced territorial development and avoid uncontrolled sprawl (OECD, 2015; Piorr et al., 2011).

- **Cities can no longer be planned only within administrative boundaries.** City planning must extend beyond these boundaries, through cross-border administrative cooperation with relevant stakeholders and policy coordination at the metropolitan and regional levels, governed by the functional urban–rural continuum (Ma & Long, 2020). As city administrations become more complex and extend beyond single administrative boundaries, governing future cities requires improved coordination and governance structures aligned with functional urban areas[5] rather than jurisdictional urban areas, which are now vital for managing growth, mobility, and infrastructure in an integrated manner.

- **National Urban Policies (NUPs) are a key instrument for guiding urban form.** NUPs are increasingly essential instruments for guiding future city development. NUPs serve as frameworks for balancing core city development with the growth of secondary cities and small urban centres, and for reducing territorial inequalities through spatial planning, investment, and regulatory tools (OECD, 2017). "Spatial structure"[6] is emphasised as a key concern in national urban policies that shape urban and territorial patterns.
- **Data and monitoring are crucial for urban governance.** Uncontrolled expansion and urban sprawl show that indicators of land consumption, density, and expansion patterns,

5 **Functional urban area,** or metropolitan areas or functional regions, according to (Ma & Long, 2020) is a concept where cities, towns, and rural areas are socio-economically tied to the urban core

6 **Spatial structure** in urban is the distribution of activities, land uses, and morphological elements in a city and its dependent areas, reflecting the physical arrangement of streets, buildings, transportation systems, and public spaces, as well as the dynamics of urban flows such as travel patterns and commuting (Dadashpoor & Saeidi Shirvan, 2024)

derived from geospatial and remote-sensing data, are becoming increasingly important. Under SDG 11.3.1, these indicators track how cities and population growth affect land-use change over time, with their impact altering ecosystems and biodiversity (Mansour et al., 2025; Siedentop & Fina, 2010).

Why This Matters for Malaysia

Malaysia's cities are already highly developed, with economic activity, high-paying jobs, and infrastructure concentrated in major metropolitan areas such as the Greater Kuala Lumpur/ Klang Valley, George Town, and Johor Bahru. These hubs act as national growth poles[7], but they also exhibit classic agglomeration features, such as rising land and housing prices in core areas, congestion on key corridors, and growing pressure on ageing infrastructure. At the same time, tell-tale signs of dispersion also appear, with cities growing rapidly through peri-urban corridors and fringe townships, where residential and industrial growth outpaces the provision of public transport, social services, and green spaces.

Major metropolitan regions such as Greater Kuala Lumpur, Johor Bahru, and Penang continue to drive national economic growth (see **Table 1**). The combined GDP share of Selangor and W.P. Kuala Lumpur, used here as an administrative proxy for Greater Kuala Lumpur, rose from 38.2% in 2015 to 41.8% in 2025, underscoring the continued concentration of economic activity in Malaysia's leading metropolitan region. Despite longstanding efforts to promote balanced regional development, economic activity remains concentrated in major urban centres. This pattern underscores the enduring influence of agglomeration economies on Malaysia's urban and economic landscape.

The increasing concentration of population and economic activity is creating growing pressures on housing affordability, mobility, infrastructure provision, and land use. Today, it shows signs of structural stress in its form, function, and performance. This has led to increasing pressure, accompanied by decentralisation of population and development activities spreading into rural and suburban areas. Some scholars and policymakers believe agglomeration, or densification, can produce positive outcomes such as increased productivity and economic competitiveness, but Malaysia’s current path presents a more complex picture.

KL today shows how the benefits of agglomeration can be increasingly accompanied by congestion, rising living costs, and growing pressure on infrastructure as urban growth outpaces planning and service provision. People move beyond urban areas in response to agglomeration pressures, where land and housing are more affordable. This leads to sprawl and development encroaching on new areas, resulting in dispersion. Dispersion is usually seen as contributing to increased car dependence, weakening economic clustering, and raising infrastructure costs. Although dispersion is generally viewed negatively, it can offer unrealised advantages when the core is overburdened and can support functional urban adaptation, creating opportunities for more equitable economic activity (Zhang et al., 2019).

Therefore, understanding the dynamic relationship between agglomeration and dispersion is increasingly important, as empirical evidence on how these two factors influence a city's spatial

7 **Growth poles,** according to Frick & Rodríguez-Pose, (2025) is centres of economic activity that benefit from agglomeration economies and spread prosperity to surrounding areas

Table 1: Share of national GDP generated by different states, 2015-2025

Year	National GDP Share (%)														
	Johor	Kedah	Kelantan	Melaka	Negeri Sembilan	Pahang	Perak	Perlis	Pulau Pinang	Sabah	Sarawak	Selangor	Terengganu	W.P. Kuala Lumpur	W.P. Labuan
2015	9.35	3.36	1.82	3.07	3.41	4.20	5.37	0.45	6.64	6.27	10.33	22.84	2.64	15.37	0.51
2016	9.49	3.35	1.83	3.07	3.40	4.14	5.37	0.45	6.71	6.31	10.13	22.93	2.61	15.59	0.52
2017	9.50	3.31	1.81	3.14	3.37	4.20	5.33	0.44	6.67	6.44	10.0	23.23	2.61	15.85	0.52
2018	9.58	3.29	1.77	3.11	3.35	4.13	5.36	0.43	6.69	6.23	9.75	23.70	2.55	16.16	0.53
2019	9.43	3.29	1.79	3.06	3.37	4.10	5.34	0.43	6.65	6.01	9.60	24.23	2.53	16.42	0.54
2020	9.51	3.42	1.87	3.05	3.44	4.08	5.52	0.43	6.89	5.78	9.47	24.28	2.53	16.15	0.57
2021	9.44	3.42	1.85	3.01	3.44	3.99	5.53	0.42	7.13	5.68	9.46	24.74	2.53	15.81	0.55
2022	9.39	3.36	1.78	3.01	3.36	4.07	5.30	0.41	7.40	5.41	9.28	25.40	2.46	15.86	0.53
2023	9.47	3.31	1.76	2.98	3.31	4.14	5.27	0.40	7.39	5.32	9.09	25.91	2.44	15.11	0.52
2024[e]	9.60	3.28	1.73	2.96	3.29	4.17	5.25	0.40	7.36	5.12	8.98	26.23	2.42	15.27	0.52
2025[p]	9.85	3.24	1.72	2.90	3.21	4.09	5.27	0.38	7.51	5.11	8.84	26.51	2.34	15.27	0.50

Source: Department of Statistics Malaysia (DOSM), GDP by State, 2015-2025; PNBRI calculations.

Note: GDP shares are calculated at constant 2015 prices using DOSM State GDP data. Figures may differ slightly from subsequent DOSM revisions. Figures for 2024 are estimates (e), while those for 2025 are preliminary (p); both are subject to revision. W.P. Kuala Lumpur includes W.P. Putrajaya through 2022. Beginning in 2023, Putrajaya is reported separately and is therefore excluded from the Kuala Lumpur series presented in this table. The shaded columns represent Selangor and W.P. Kuala Lumpur, used as an administrative proxy for Greater Kuala Lumpur. Comparisons across 2022-2023 should therefore be interpreted with caution due to the change in geographic coverage.

patterns remains insufficient (Garcia-López & Muñiz, 2013). Against this backdrop, exploring how Malaysian cities have developed provides valuable insights into how policy measures can balance these forces while encouraging sustainable, resilient urban growth. The policy challenge is therefore not whether agglomeration should occur, but how to distribute its benefits more effectively across Malaysia's wider system of cities.

The following section explains how Malaysian cities have evolved, with policies in place to balance economic growth and environmental sustainability and create liveable, resilient cities for future generations.

Malaysia's Urban Transition: How Are Cities Evolving?

Examining the historical drivers of Malaysia's agglomeration patterns reveals that they stem from the country's post-1970 development strategy. The introduction of the New Economic Policy (NEP) in 1971 marked a major turning point, aiming to restructure the socio-economic system and eradicate poverty. Through NEP initiatives such as rural development, expanded educational access, and a major push into manufacturing and services, new opportunities beyond agriculture began to emerge. Over three decades, these changes helped reduce poverty from about 52.4% in 1970 to roughly 5-6% in the early 2000s (Mok et al., 2007).

Migration was central to this transformation. Massive migration occurred during this period, as people moved to cities in search of better employment and higher living standards. From the

early 1970s onward, low wages and limited prospects in the agricultural sector pushed people to migrate to cities. In addition, the Free Trade Zone Act (1971) and the first Free Trade Zone (FTZ) in Bayan Lepas, Penang, were marked as the beginning of export-oriented industrialisation, with multinational firms such as Intel and HP establishing operations in Malaysia. Malaysia then became a significant hub for Electronic and Electrical (E&E) manufacturing, thereby strengthening the pull toward cities in pursuit of industrial and service jobs.

This trend led to large-scale internal migration in Peninsular Malaysia. Studies of internal migration in Malaysia showed that a large share of these flows was captured by a small number of growth poles, with an economic structure based on the manufacturing sector, notably the Klang Valley, Penang and southern Johor, reinforcing their role as national urban–industrial magnets (Golam Hassan, 2017; Tey, 2014). Historically, this shows that shifts in industry and services are essential to Malaysia's development.

If we look at Malaysia's development through its series of Malaysia Plans (MPs), the earlier plans, especially from 2MP to 4MP (1971-1985), displayed a significant shift from a predominantly rural focus to a strong concentration on the urban-industrial sector. Moving away from policies centred on rural development, basic infrastructure, and poverty alleviation, the NEP in 2MP brought significant structural changes, shifting the economy from low-productivity agriculture to manufacturing and services. This drove extensive rural–urban and interstate migration, laying the foundations for today's strong agglomeration but also widening regional inequalities.

Starting in the mid-2000s, the policy increasingly concentrated on the spatial effects of this trajectory. In 2006, the 9th MP introduced the five regional economic corridors to address regional disparities and promote growth beyond the Klang Valley, establishing a new agglomeration centre. This effort continues in subsequent plans, where the 10th MP explicitly refined the spatial strategy centred on urban agglomerations and corridors linking clusters, viewing metropolitan regions as key drivers of growth. By the 11th and 12th MP, the focus shifted to creating competitive cities as drivers of change and, more recently, to balancing regional development with the smart city agenda to intentionally shape agglomeration and manage dispersion across Malaysia's urban areas system.

Table 2 summarises official MP documents from 1971 to 2025. Overall, Malaysia's development trajectory reflects a sustained policy commitment to balanced regional development, yet translating these spatial strategies into tangible outcomes has been challenging. Malaysia's spatial policy has progressively shifted from rural development and poverty reduction to regional corridors and metropolitan-led growth. Nonetheless, the advantages of concentration have not been evenly distributed across other regions, preventing the development of a balanced and interconnected national urban system.

Table 2: Malaysia's Spatial Development Trajectory: Intended Strategies and Observed Patterns, 1971–2025

Plan	Intended spatial strategy	Reported outcome or later official assessment	Reference
Second Malaysia Plan (2MP) (1971 - 1975)	Implement the New Economic Policy (NEP) by **reducing poverty** irrespective of ethnicity, restructuring society, expanding employment, developing rural areas, and improving access to infrastructure and public services.	• Rural and socioeconomic development received substantial policy attention. However, **regional and structural disparities persisted,** and subsequent plans addressed them. • Does not establish direct causation for early metropolitan concentration.	*(Second Malaysia Plan, 1971 - 1975 | Official Portal of Ministry of Economy, n.d.)*
Third Malaysia Plan (3MP) (1976-1980)	**Reduce interstate and regional disparities** by directing development towards less-developed states, establishing new development and settlement areas, expanding employment opportunities, and encouraging urban development beyond the established centres.	• **Regional development programmes and planned settlement schemes were expanded**, but the continuation of regional redistribution policies in later plans indicates that convergence remained incomplete. • The outcome was described as partial, not complete, spatial equalisation.	*(Third Malaysia Plan, 1976 - 1980 | Official Portal of Ministry of Economy, n.d.)*
Fourth Malaysia Plan (4MP) (1981-1985)	**Continue the objectives of the NEP** while promoting industrialisation, regional development, infrastructure provision, and growth-centre initiatives in less-developed areas.	• **Industrial activity remained geographically concentrated.** A retrospective review in the Fifth Malaysia Plan reported that the **Central, Northern and Southern regions together accounted for about 88% of national manufacturing output by 1985.** • The statistic refers to broad industrial regions and should not be reduced to Kuala Lumpur and Penang alone.	*(Fifth Malaysia Plan, 1986 -1990 | Official Portal of Ministry of Economy, n.d.; Fourth Malaysia Plan, 1981 -1985 | Official Portal of Ministry of Economy, n.d.)*

Plan	Intended spatial strategy	Reported outcome or later official assessment	Reference
Fifth Malaysia Plan (5MP) (1986-1990)	**Support economic recovery, export-oriented manufacturing and private-sector participation,** while consolidating regional growth centres, rural growth centres and existing infrastructure.	• **Regional and growth-centre development proceeded unevenly. Existing industrial centres and areas with stronger infrastructure** remained comparatively well positioned to attract economic activity. • The evidence does not support a claim that regional growth-centre policies produced uniform interstate convergence.	*(Fifth Malaysia Plan, 1986 -1990 | Official Portal of Ministry of Economy, n.d.)*
Sixth Malaysia Plan (6MP) (1991-1995)	Implement **balanced development under the National Development Policy (NDP)** by reducing regional disparities, improving living standards in less-developed states, strengthening regional linkages, and diversifying state and regional economies.	• Rapid economic growth, **urbanisation and migration continued**. Selangor experienced particularly high population growth, which official reviews largely attributed to substantial net in-migration. • **Employment and economic opportunities in the wider Kuala Lumpur-Selangor region were key drivers of this pattern,** though migration should not be attributed to a single cause.	*(Sixth Malaysia Plan, 1990 - 1995 | Official Portal of Ministry of Economy, n.d.)*
Seventh Malaysia Plan (7MP) (1996-2000)	**Reinforce balanced social and economic development,** ensure that growth was shared more equitably among states, raise living standards, and diversify the economies of less-developed states.	• **Socioeconomic conditions improved across the country, but the results varied by state and indicator.** Selangor and the Federal Territory of Kuala Lumpur remained prominent in **selected measures such as population concentration, household income and investment attraction.** • Any published comparison should identify the particular indicator and reference year.	*(Seventh Malaysia Plan, 1996 - 2000 | Official Portal of Ministry of Economy, n.d.)*

Plan	Intended spatial strategy	Reported outcome or later official assessment	Reference
Eighth Malaysia Plan (8MP) (2001-2005)	**Optimise the economic potential of all states,** diversify the economies of less-developed states, improve infrastructure and amenities, encourage knowledge-based activities, and strengthen regional and international linkages.	• Growth and improvements in living standards continued, **but regional and rural-urban disparities remained.** • **The first National Physical Plan (NPP) was approved in 2005.** It should therefore be presented as an end-of-period institutional milestone, rather than as a spatial framework implemented throughout the entire 8MP period.	*(Eight Malaysia Plan, 2001-2005 | Official Portal of Ministry of Economy, n.d.; NATIONAL PHYSICAL PLAN [NPP], n.d.)*
Ninth Malaysia Plan (9MP) (2006-2010)	Promote balanced regional development through regional economic corridors, existing and rural growth centres, urban conurbations, and cross-border development initiatives to spread investment and improve regional balance.	• The regional corridors established new investment locations, infrastructure projects and sectoral clusters, but investment realisation varied. • The corridors were established as implementation geographies and carried forward into the 10MP. • The former RM307.1 billion committed/RM174.5 billion realised statistic is removed from this row because the 11MP explicitly reports it for 2011–2014, during the 10MP review period.	*(Ninth Malaysia Plan, 2006 - 2010 | Official Portal of Ministry of Economy, n.d.)*
Tenth Malaysia Plan (10MP) (2011-2015)	Deliberately **leverage urban agglomeration, economic density, industrial clusters and connectivity to increase productivity.** Greater Kuala Lumpur was treated as a principal national growth centre, while **other major cities and conurbations were expected to develop complementary or specialised economic roles.**	• **Greater concentration in major urban regions** was partly an intended feature of the policy rather than, by itself, evidence of planning failure. • Evaluation should instead **consider whether transport, labour-market and economic linkages enabled productivity and investment benefits to extend to surrounding towns and regions.**	*(Tenth Malaysia Plan (10th MP), 2011-2015 | Official Portal of Ministry of Economy, n.d.)*

Plan	Intended spatial strategy	Reported outcome or later official assessment	Reference
Eleventh Malaysia Plan (11MP) (2016-2020)	Develop competitive, liveable, inclusive and sustainable cities; continue investment in regional economic corridors; improve urban-rural linkages; and use major cities as catalysts for wider regional growth.	• Urban and regional initiatives progressed, **but the 2018 Mid-Term Review identified increasing urban sprawl, weak urban mobility and connectivity, high dependence on private vehicles, and traffic congestion.** • The 12MP's completed-period review reported that 5 of 8 selected regional-balance targets were achieved. Rural roads, electricity and telecommunications targets were met or exceeded, but the urban–rural income ratio was 1:0.58 in 2019 against a 1:0.67 target. • Regional GDP per capita remained widely dispersed: Central region RM62,886 versus Sabah region RM22,858 in 2020.	*(Eleventh Malaysia Plan (11 MP) 2016-2020 | Official Portal of Ministry of Economy, n.d.; Mid-Term Review of the Eleventh Malaysia Plan 2016-2020 | Official Portal of Ministry of Economy, n.d.; Twelfth Malaysia Plan, 2021-2025, n.d.-a)*
Twelfth Malaysia Plan (12MP) (2021-2025)	Optimise regional economic potential, develop sustainable and resilient cities, transform rural areas, improve infrastructure and connectivity, and intensify development in less-developed states, particularly Sabah and Sarawak.	• Mid-term indicators asserting **nationwide or uniform "unstructured sprawl" would need distinct land-use, built-up-area, or remote-sensing evidence.** • The 13MP's review was published in July 2025 and principally assesses 2021–2024; it therefore provides an official end-period assessment but not a complete calendar-2025 result. It reports **continued regional gaps and carries regional rebalancing into the next plan.**	*(Rancangan Malaysia Ketiga Belas (RMK13) Melakar Semula Pembangunan Rancangan Malaysia Ketiga Belas (RMK13), n.d.; Twelfth Malaysia Plan, 2021-2025, n.d.-b)*

Note: The table was developed using AI-assisted tools to support initial synthesis and drafting, while all policy statements, page references and interpretations were manually verified against the sources.

System of Cities in Malaysia

Over the past few decades, the National Physical Plan (NPP), or Rancangan Fizikal Negara (RFN), has been crucial in guiding Malaysia's development. It provides a framework for translating national policies into spatial and physical forms. Since its launch in 2005, the NPP has evolved to promote a more efficient and balanced urban system through conurbations, corridors, and a clear hierarchy within the urban framework, as seen in the most recent NPP4. However, despite these efforts, urbanisation patterns remain highly uneven and concentrated, with major metropolitan areas continuing to capture a disproportionate share of population, investment, and economic activity.

According to the Department of Statistics Malaysia (DOSM), the country's urbanisation rate has tripled from 28.4% in 1970 to 75.1% in 2020 (Bernama, 2022). Separately, the share of Malaysia's population living within City Hall and City Council jurisdictions rose from 22% in 2010 to 38% in 2020 (DOSM, 2022), reflecting the continued concentration of population in major urban centres. The following section builds on this paradox by examining Malaysia's urban system and the emerging spatial patterns of agglomeration, dispersion, and peri-urbanisation now visible on the ground.

Malaysia's urbanisation is best understood as a network of cities. Classical urban theory views cities as interdependent nodes in a network where changes in one city's economy, population, or infrastructure affect others through flows of people, goods, capital, and information (Peris et al., 2018). Policymakers must adopt this perspective to move from individual city growth targets towards functional relationships that shape national competitiveness and spatial equity.

In Malaysia, the World Bank-Think City report describes a "system of cities" as an interconnected network of metropolitan regions, regional cities, and smaller towns that collectively drive national development, rather than a few large cities operating independently (The World Bank & Think City, 2024). This concept is formalised in planning practice through the National Urbanisation Policy 2 (NUP2), which establishes a hierarchy based on scale, function, and sphere of influence, rather than solely on population size (PLANMalaysia, 2016, 2019). The NUP 2 sets out a five-level hierarchy of cities comprising:

- **Metropolitan areas (Bandar Global): (**a) Population size over 3.5 million; (b) a city that plays a key role in the global economic system and meets most or all of the 13 Global City criteria set out in DPN2; and (c) functions as an international hub, not merely a national or state centre. (e.g. Kuala Lumpur, Putrajaya)

- **Regional cities (Bandar Wilayah):** (a) Population size between 1.5 – 3.5 million; (b) a state capital with economic and administrative influence that extends beyond its state and even national borders, and (c) has stronger international/ inter-regional economic influence than other state capitals and meets several of the Global City criteria (e.g. Labuan, George Town, Kuantan, Kota Kinabalu, Johor Bahru)

- **State Capital City (Bandar Negeri):** (a) No minimum population size; (b) state capitals that are not classified as Bandar Global or Bandar Wilayah; and (c) their main role is as the state administrative centre, and often also the principal economic growth centre of the state. (e.g. Alor Setar, Kuala Terengganu, Kota Bharu, Melaka)concern in national urban policies that shape urban and territorial patterns.

- **Primary Town (Bandar Utama):** (a) Population size: > 100,000 people; and (b) acts as a significant centre of economic growth within a state, though not necessarily its capital. (e.g. Ayer Keroh, Iskandar Puteri, Temerloh, Chukai)

- **Local Town (Bandar Tempatan):** (a) Population size: 10,000–100,000, or a district administrative centre even if the population is less than 10,000; and (b) provides business and/or administrative services to smaller surrounding areas; serves a more local catchment than a primary town. (e.g. Pasir Mas, Alor Gajah, Bahau, Cyberjaya)

This qualitative hierarchy matters because it supports national spatial strategies and provides a framework for addressing agglomeration costs that is not rigidly tied to population numbers alone, but also to factors such as economic activity, congestion, and housing pressures, while encouraging balanced territorial growth through polycentric development. Despite this hierarchy and planned system of cities, recent trends still show very uneven urbanisation in Greater Kuala Lumpur, the Penang-Seberang Prai conurbation, and the Johor Bahru-Iskandar region. This indicates that these cities continue to capture a disproportionate share of population, investment, and economic activity, while many secondary cities and smaller towns function mainly as spillover zones.

The 2024 Gross Domestic Product (GDP) data clearly show that Selangor (6.3%), Johor (6.4%), W.P. Kuala Lumpur (6.2%), and Penang (4.8%) experienced higher GDP growth, and together accounted for 59.2% of Malaysia's total GDP (DOSM, 2024). This is evident in the high concentration of economic activity in these states, reflecting their concentration of high-value services, finance, business headquarters, and knowledge-intensive employment. States like Johor, for example, whose GDP is driven by a 42.7% growth in the construction sector, along with strong services and manufacturing sectors, signal significant investment inflows and industrial expansion. Penang, as another example, anchors Malaysia's export economy, supported by its electrical and electronics (E&E) manufacturing base.

These advantages foster deeper labour markets, higher productivity, and greater returns, reinforcing why investment, talent, and economic activity continue to concentrate in these leading urban regions. However, this concentration has led to uneven territorial outcomes, emphasising the need to actively develop functional linkages, boost regional competitiveness, and reduce risks associated with both over-concentration and uncontrolled sprawl. The extent to which the **actual development pattern on the ground** matches this planned system remains an empirical question.

Building on this, Malaysia's urban system has been shaped by decades of economic restructuring, demographic shifts, and spatial policies that concentrated growth in key metropolitan regions, resulting in uneven development patterns across the country. Understanding how these factors shaped the spatial arrangements observed across Malaysia's main metropolitan regions provides context for how our cities have evolved. Before examining how they affect spatial arrangements, we need to understand how spatial arrangements have changed over the last decade. The next chapter examines these changes, highlighting the specific patterns that have emerged in some of Malaysia's major cities.

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Chapter 2: Spatial Patterns of Agglomeration and Dispersion

Malaysia's cities are expanding, but the question is whether the actual development patterns align with planning intent or with the spatial development trajectory on the ground. This chapter examines how our cities have grown over time by analysing their spatial patterns to determine whether they reveal concentration, dispersion, or corridor-led expansion.

To analyse spatial patterns, we use satellite-based nighttime light (NTL) data from the Visible and Infrared Imaging Suite (VIIRS) Day-Night Band (DNB), processed as annual composites in Google Earth Engine (GEE). NTL act as an "X-ray" to reveal patterns in how Malaysian cities change over time. They provide a consistent, **remote-sensing proxy** for urbanisation, demographic change, economic activity, and power consumption over time (Zhao et al., 2022). Light intensity correlates with electricity consumption and population, indicating that the brightest clusters reflect genuine concentrations of people and economic activity rather than sensor artefacts, such as technical distortions that make city centres appear artificially wide or uniformly bright.

In this section, NTLs are utilised to analyse the spatial patterns of Malaysia's three major metropolitan areas: Kuala Lumpur, Pulau Pinang and Johor Bahru. This chapter focuses solely on these 3 primary metropolitan regions because of their structural significance in shaping Malaysia's urban patterns. Because the objective is not to represent all Malaysian cities, these metropolises allow the analysis to capture the most visible national patterns of agglomeration and dispersion, which may be less observable in smaller cities.

A pixel-based classification using the HSV (Hue, Saturation, and Value)[8] colour space quantifies urban brightness patterns from the heatmap panels. Each pixel was categorised into four intensity classes based on hue, saturation, and brightness thresholds:

- **High intensity:** Labelled with red/ yellow tones with high brightness (Value ≥ 0.65) and saturation (S ≥ 0.35), to represent dense urban cores and intense activity.
- **Medium intensity:** Labelled with green/ cyan hues or bright whites with moderate brightness (Value ≥ 0.50), to indicate active built-up areas, suburban or industrial zones.
- **Low intensity:** Labelled with blue/ purple tones with lower brightness (Value ≥ 0.25), to correspond with peri-urban areas.
- **Dark:** Not colour labelled and represented with very low brightness (Value < 0.18), to represent rural or undeveloped regions.

8 HSV colour model according to Sharma et al., (2016) is suggested for better identification and extraction.

The classification was applied uniformly across all panels. For each year, the proportion of pixels in each category was calculated as:

$$\text{Intensity Percentage} = \frac{\text{Number of pixels in category}}{\text{Total pixels in panel}} \times 100$$

The extraction of pixel counts for each intensity category was analysed using AI-assisted image processing, with the predefined HSV classification threshold. The calculated percentage follows a standard proportional method, ensuring comparability across time and location.

The technique provides a relative measure of brightness distribution, allowing temporal comparisons of urban morphology[9]. While the method is based on rendered heatmaps rather than raw radiance values, it is internally consistent and follows well-established remote-sensing practices in urban studies. Therefore, they are considered sufficient for our purpose. However, a more scientifically rigorous approach would require validation against the Consistent and Corrected Nighttime Light (CCNL) radiance composites.

The application of NTL has become widely used across various research fields, particularly in the study of human activity, urbanisation, demographic change, environmental change, and socio-economic development (McSharry & Mawejje, 2024; Yang et al., 2021; Q. Zheng et al., 2023; Y. Zheng et al., 2022). Previous studies have employed this method to link NTL to economic indicators, land-use changes, population density, and even the spatial structure of cities. In this work, NTL is used to examine how three major Malaysian cities have changed spatially over time, providing context for the current study of agglomeration and dispersion through patterns of urbanisation and development. This offers insights into the dynamics of urban growth and can guide future urban planning and policy decisions in Malaysia.

The following outlines how Kuala Lumpur, the Greater Klang Valley, Pulau Pinang, and Johor Bahru have evolved geographically from 2015 to 2025. For analysis purposes, this report uses NTL data sourced from the VIIRS Day/Night Band (DNB) monthly cloud-free composites produced by the Earth Observation Group (EOG), Payne Institute for Public Policy (VIIRS Nighttime Light, n.d.). Analysing variations in nighttime light intensity helps us understand a city's spatial patterns.

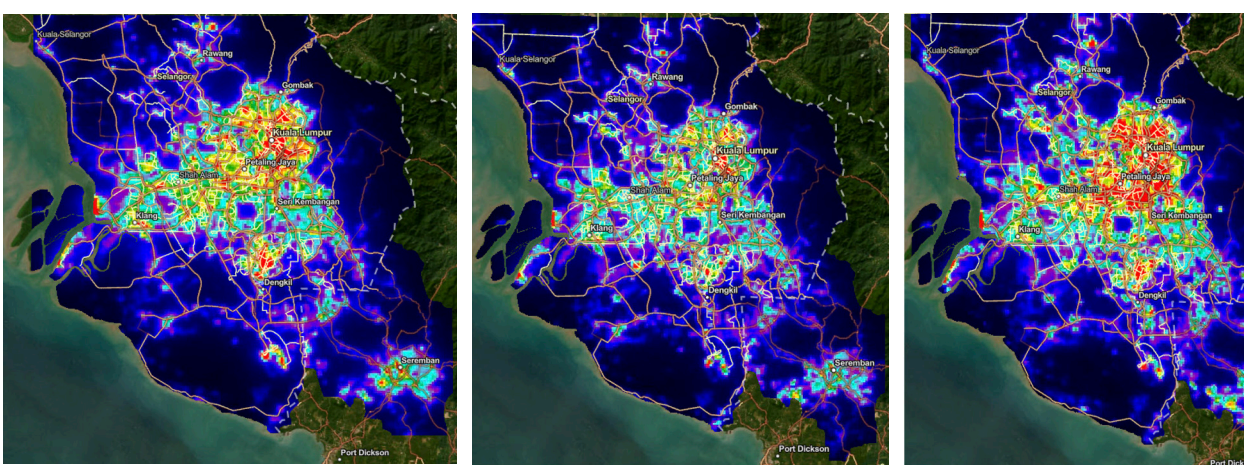
9 **Urban morphology** is the study of the built environment, focusing on the physical form and structure of urban spaces, including layers of historical significance and the socio-economic implications of urban development (Schneider-Sliwa, 2015; Urban Morphology - an Overview | ScienceDirect Topics, n.d.).

Greater Kuala Lumpur/ Klang Valley

Since the 1990s, Kuala Lumpur has rapidly expanded beyond the city centre, with a continuous built-up area extending into the broader Klang Valley. Historically, Kuala Lumpur's role as Malaysia's economic and administrative hub has created development pressure, driving the decentralisation of population and economic activity into the surrounding areas. Over time, satellite towns such as Petaling Jaya and Shah Alam have become increasingly interconnected through infrastructure expansion and industrial growth. The area has since evolved into a dense, highly interconnected urban cluster that continues to expand.

As shown in **Figure 1,** the expansion of the Klang Valley core was notable and gradual. Between 2015 and 2025, Kuala Lumpur's **spatial growth occurred mainly along corridors rather than** uniformly in all directions. From 2015 to 2020, the imagery shows a dense, bright core around central Kuala Lumpur, Petaling Jaya, and Subang Jaya, **while medium-intensity zones appear to have extended westward toward Shah Alam and Klang, and southward toward Serdang, Putrajaya, Sepang, and Seremban.**

Figure 1: Kuala Lumpur spatial pattern observation using NTL



2015 2020 2025

Starting in 2020, the city's growth pattern reflects the pandemic's impact, with disruptions followed by signs of recovery. Post-pandemic (2022-2025), development has accelerated, with secondary clusters emerging along major highways and economic zones, indicating a shift toward a polycentric metropolitan structure that favours linear expansion along transport corridors rather than uniform radial sprawl. This shows how long-term agglomeration forces have produced a metropolitan region characterised by corridor-based growth, intensified secondary centres, and an increasingly polycentric urban form.

The intensity distribution and cluster morphology support the visual trends (see Table 1). In 2015, only 2.48% of pixels were very bright, with a single dominant high-intensity cluster (2,252 pixels) and a few small satellites. This pattern suggests a compact, intensely lit core city surrounded by a broad, continuous urban area belt. However, by 2020, bright pixels fell below 1%, low-brightness pixels increased to 61.82%, and the high-intensity cluster shrank to 528 pixels, forming more, smaller clusters. This reveals a weakened, fragmented core, alongside the emergence of lower-intensity development at the periphery.

Table 1: NTL intensity and morphology of 8-connected clusters in Kuala Lumpur

Year	Intensity distribution				High-Intensity Cluster[10] Morphology (8-connected cluster[11])		
	High	Med	Low	Dark	High Clusters (Count)	Largest Cluster (px)	Avg Size Other Clusters (px)
2015	2.48%	55.44%	41.60%	0.49%	28	2,252	27.15
2020	0.99%	34.43%	61.82%	2.76%	36	528	18.71
2025	4.12%	42.07%	52.53%	1.28%	61	3,390	25.77

Source: GEE, Author's calculations

In 2025, the share of very bright pixels rose to 4.12%, and the largest cluster expanded to 3,390 pixels. The number of clusters increased to 61, indicating both core intensification and the emergence of secondary centres along major corridors. While the sharp 2020 decline likely reflects temporary pandemic-related disruption, the strong recovery by 2025 confirms that expansion resumed quickly. Overall, the evidence suggests that **Greater Kuala Lumpur is evolving from a compact city into a more polycentric metropolitan region, with growth extending along highways beyond the original city boundary.**

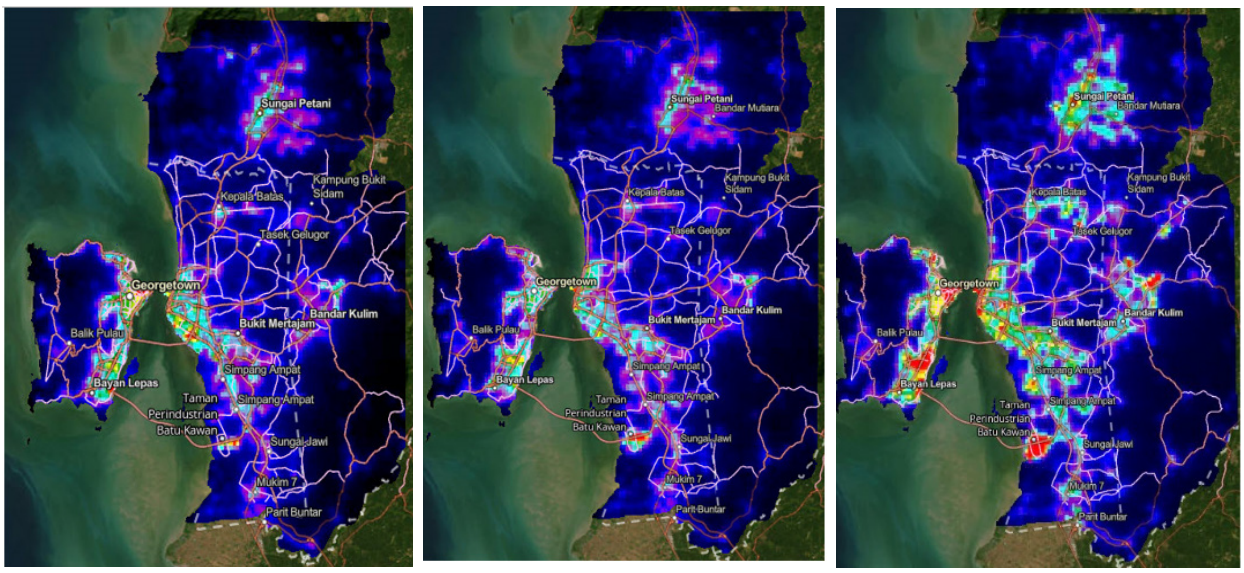
Pulau Pinang

A structural shift shaped Penang's development after it lost its free port status in 1969, leading to export-oriented industrialisation under Lim Chong Eu in 1970. The Bayan Lepas Free Industrial Zone, established in 1972, anchored the state's electronics manufacturing sector, concentrating economic activity on Penang Island. Today, it has expanded to the mainland, particularly into several emerging areas such as Seberang Perai and the Kulim area.

Penang is evolving from a compact island-anchored city to a more balanced island-mainland metropolitan region. In 2015, the pattern was dominated by a concentrated bright core near George Town and Bayan Lepas on Penang Island, with areas considered as "moderate intensity" extending across the channel to Butterworth on the mainland. This indicates a relatively compact urban structure, anchored by the island's status as the primary economic and administrative centre.

10 In image analysis, a **cluster** is a group of adjacent pixels that share the same classification—in this case, High-intensity pixels.
11 **8-connected** means that a pixel is considered connected to its 8 neighbours: (a) Horizontally (left/right), (b) Vertically (up/down), and (c) Diagonally (top-left, top-right, bottom-left, bottom-right)

Figure 2: Penang spatial pattern observation using NTL



2015 2020 2025

By 2020, the bright island core remained strong, but the mainland intensified noticeably, particularly around Butterworth and along the corridor to Bukit Mertajam and Kulim. The mainland lights thickened along key roads and trunk routes, indicating industrial and residential expansion in Seberang Perai and the Kulim Hi-Tech Park hinterland, consistent with Penang's manufacturing-driven growth strategy.

Multiple high-intensity clusters are visible on the island and mainland in 2025, as the pattern becomes more dispersed and polycentric. The mainland's noticeable brightening along the north-south axis toward Sungai Petani suggests stronger integration with Kedah's industrial zones. Increasing luminosity on the mainland indicates a dual-core metropolitan structure that is progressively developing into a broader regional urban network, while the island maintains its core brightness.

Table 2: NTL intensity and morphology of 8-connected clusters in Penang

Year	Intensity distribution				High-Intensity Cluster Morphology (8-connected cluster)		
	High	Med	Low	Dark	High Clusters (Count)	Largest Cluster (px)	Avg Size Other Clusters (px)
2015	0.14%	49.21%	49.60%	1.04%	12	61	9.73
2020	0.09%	51.85%	47.06%	1.00%	7	31	12.17
2025	0.76%	48.90%	48.58%	1.77%	30	187	24.79

Source: GEE, Author’s calculations

Table 2 supports this interpretation through intensity and cluster morphology. Medium- and low-brightness categories of areas (each around 48–52% of pixels) dominated Penang over the three years, indicating a widely urbanised coastal belt rather than a single, overly concentrated hotspot. The number of the largest high-intensity clusters grew from 61 to 187 pixels, while the share of high-intensity clusters rose from about 0.14–0.09% between 2015 and 2020 to 0.76% in 2025. In addition, the number of high-intensity clusters increased from 7 in 2020 to 30 in 2025, and their average size more than doubled during the same period. Taken together, these patterns demonstrate Penang's transition from a few small bright spots to a more brightly lit, multi-node coastal corridor, with a mainland centre and an island centre each playing an important role in an interconnected regional system of cities.

Johor Bahru

While Kuala Lumpur and Penang evolved primarily as domestically driven economic hubs, Johor Bahru's growth is closely linked to its proximity to Singapore, which shapes a cross-border, corridor-based economic system. Compared with the cities described above, Johor Bahru differs because its urban form is shaped not by a central core but by a cross-border effect, producing a dispersed, corridor-based pattern of growth.

Figure 3: Johor Bahru spatial pattern observation using NTL



2015 2020 2025

Johor Bahru changed from a primarily monocentric core to a more dispersed polycentric system centred on a coastal corridor connecting Johor Bahru to the Singapore border. The 2015 pattern shows a relatively continuous bright belt along the Johor Straits, connecting Johor Bahru, Pasir Gudang, Skudai, and the surrounding industrial areas.

This bright belt appears to have shrunk in 2020, indicating increasing fragmentation and suggesting that Johor Bahru's once-continuous urban belt is breaking up into several smaller centres. On the map, the coastal strip remains clearly lit, but the brightness is patchier, with more dark areas behind it. By 2025, the spatial pattern becomes even more corridor-like and fragmented, with several medium-brightness clusters stretched along the coast and main roads, separated by larger, dark inland areas. The distribution of NTL intensity in Johor Bahru indicates that the share of high-intensity pixels fell from 3.51% in 2015 to 2.68% in 2020, and then to 1.62% by 2025. Meanwhile, the share of dark pixels increased sharply from 1.06% to 24.35% over the same period. Although the data show anomalies, they reflect uneven activation rather than reduced urban expansion. In other words, **Johor Bahru continues to expand spatially, but not all areas are being actively used**. As a result, more spaces remain underutilised, leading to lower night-time activity.

Table 3: NTL intensity and morphology of 8-connected clusters in Johor

Year	Intensity distribution				High-Intensity Cluster Morphology (8-connected cluster)		
	High	Med	Low	Dark	High Clusters (Count)	Largest Cluster (px)	Avg Size Other Clusters (px)
2015	3.51%	46.68%	48.75%	1.06%	44	2,438	20.12
2020	2.68%	47.65%	31.77%	17.9%	59	852	28.60
2025	1.62%	41.89%	32.14%	24.35%	65	683	13.03

Source: GEE, Author's calculations

Consistent with this, the number of high-intensity clusters increased (44 → 59 → 65), while the size of the largest cluster decreased (2,438 px → 852 px → 683 px). This indicates that a single bright core no longer dominates southern Johor. Instead, light (and thus activity) is spreading across multiple smaller bright centres along the Johor Bahru–Singapore axis and major transport routes, with more unlit or dimly lit areas in between. This trend indicates an emerging "**string-of-pearls" metropolitan corridor, in which coastal and border areas have become increasingly significant, risking the exclusion of inland regions and leaving them behind economically** if planning and infrastructure development in those areas do not keep pace.

Insights from NTL-based Spatial Patterns Across Malaysia's Major Cities

Analysis of NTL spatial patterns across these three major cities reveals significant changes in how cities expand and develop. It highlights distinct urban growth trajectories. In summary, our analysis of NTL-based spatial patterns shows that:

- **Society adapts to the system that has been established.** The spatial patterns observed in the NTL data demonstrate how human behaviour responds to current institutional systems. Specifically, high-intensity clusters in urban areas, along with the emergence of new small clusters and corridor-based nodes, indicate how economic activities and daily movement unfold. The pattern suggests that individuals and firms operate within, and respond to, a system shaped by planning rules, infrastructure, governance, and social norms (Viale, 2025). As such, the intensification of the city centre and the expansion of corridor-based nodes show how people navigated the opportunities and constraints built into the system.

- **The current urban systems in these three Malaysian major cities incentivise dispersion, not compactness.** In direct contrast to emerging and contemporary "urbanism" movements that advocate sustainable, human-scaled urban design to combat sprawl and promote more compact cities, Malaysia's current urban system appears designed to favour dispersion through road-expansion policies and vigorous car-oriented development. The proliferation of new towns on the outskirts (where land is cheaper) has worsened this, sparking a long-running debate that continues to shape today's mobility behaviour (Hidayati et al., 2021).

- **Urban systems in these cities, particularly KL and Greater KV, have become overloaded, and the carrying capacity is unable to accommodate continuous growth.** The sharp expansion of the high-intensity cluster to 3,390 pixels observed in KL, followed by its contraction in 2020, suggests not only spatial instability but also an imbalance between population growth and infrastructure capacity. This reflects how a surge in urban demand has outpaced KL's carrying capacity[12]. A recent public backlash over worsening traffic congestion[13] and recurring train disruptions[14] are mere symptoms of this imbalance. This indicates the need for further assessment of transport, housing, public services, and environmental carrying capacity.

- **Polycentric or secondary cities have emerged organically.** As growth intensifies and urban cores approach their functional and spatial limits, the surrounding areas will expand organically. This was evident from the fragmentation of high-intensity clusters and the emergence of several medium-brightness nodes, indicating that development is no longer focused on a single dominant centre.

- **Transportation corridors are emerging as new urban spines.** The NTL analysis of the three major cities clearly showed that growth clusters follow the development of major highways, industrial routes, and coastal corridors. This suggests a shift towards a much more linear urban pattern driven by transport infrastructure, rather than central agglomeration forces.

- **Economic factors have a hand in the emerging spatial divide and polarisation.** The earlier NTL patterns revealed how Johor Bahru's urban lightscape has developed into a two-speed system: a rapidly brightening coastal corridor, and in contrast, dimming, fragmenting interior areas. This indicates a polarised urban system heavily reliant on cross-border economic dynamics with Singapore.

From Patterns to Drivers: Setting the Context

This chapter provided an NTL analysis of the spatial distribution of agglomeration and dispersion in major Malaysian cities. The NTL-based findings highlighted not only where growth occurred but also how cities reorganised in response to institutional incentives, infrastructure constraints, and shifting economic pressures. These spatial dynamics have significant implications for economic competitiveness, social equity, and climate resilience, showing that systemic forces shape urban form and influence future development outcomes. Understanding these patterns provides an essential foundation for formulating policies that go beyond broad urban growth strategies towards more targeted, place-specific interventions.

Building on these empirical observations, the following chapter examines several factors that may have influenced the agglomeration and dispersion of cities, thereby enhancing our collective understanding of the characteristics of "future cities" and our ability to reconfigure urban systems that promote balanced, sustainable growth.

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12 **Urban carrying capacity** refers to the maximum level of human social and economic activities that urban areas can support while preserving ecological stability and resource sustainability (Li et al., 2022).

13 Going Nowhere: Klang Valley Traffic Jam Costing Malaysia RM54mil a Day, n.d.

14 No Breakdown: Rapid Rail Says Morning Kelana Jaya LRT Train Withdrawals Were for Minor Repairs | Malay Mail, n.d.

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Chapter 3: Factors Influencing Agglomeration and Dispersion

A constantly dynamic tension defines urban development. It is a perpetual tug-of-war between centripetal forces that pull economic activity and population together (agglomeration) and centrifugal forces that push them apart (dispersion) (Fujita et al., 2021). This interplay shapes a metropolis's physical footprint, economic vitality, and social resilience. For planners and policymakers, understanding this balance is essential to steer urban change rather than merely react to it.

Academic consensus suggests that these forces are systemic. In the early stages of development, efficiency dictates agglomeration; firms and workers concentrate in specific locations to share resources and knowledge. However, as cities mature, "diseconomies of scale" occur (Henderson, 2005). This concept suggests that beyond a certain point, the agglomeration benefits of a concentrated population (such as increased innovation and efficiency) are offset by rising negative externalities, such as congestion, pollution, and higher costs. This triggers dispersion, pushing growth outward. Understanding this evolution is critical to identifying where a city sits in the development stage, and to determining the policy interventions required to manage its trajectory.

A Thematic Analysis for Identifying These Factors

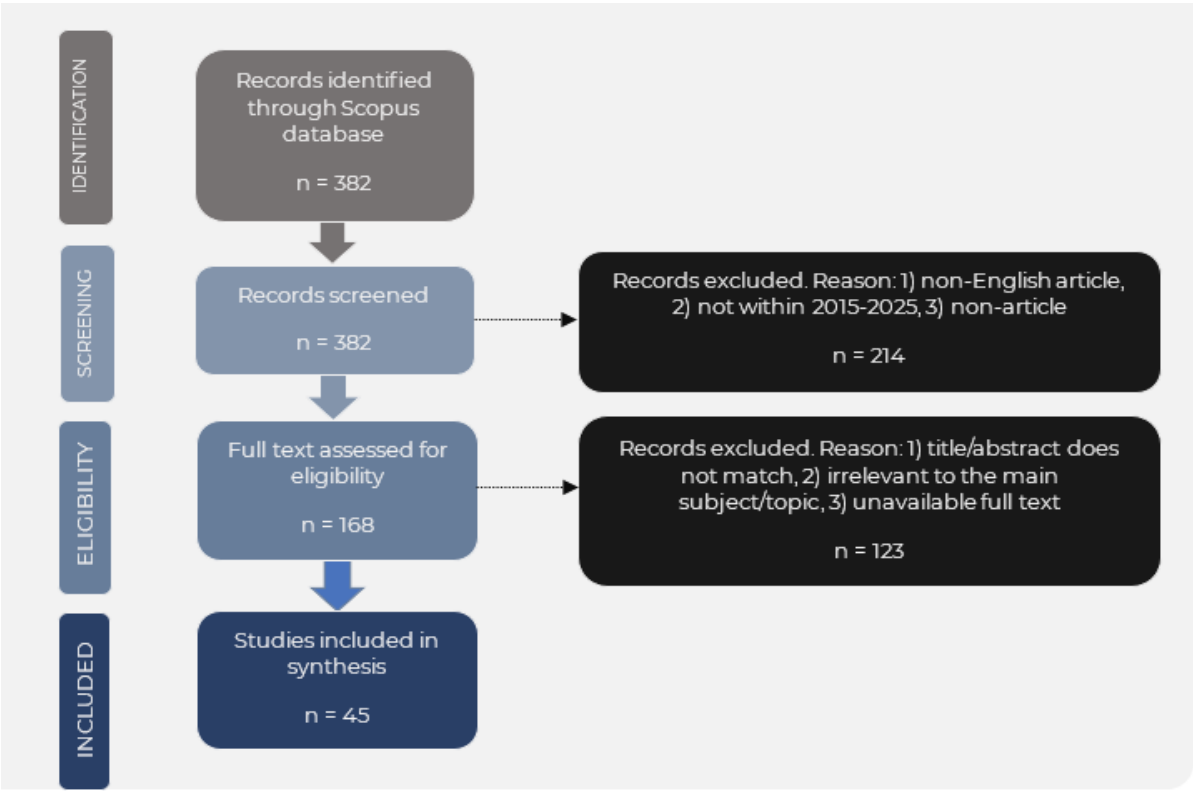
The thematic analysis in this chapter drew from a Systematic Literature Review (SLR) process. SLR offers a robust framework for synthesising existing knowledge and gaining deep insights into a specific research domain (Khudzari et al., 2023; Mok et al., 2015). This study commenced with a rigorous "Title/Abstract/Keyword" (T/A/K) search within the Scopus database. Scopus was selected as the primary data source because it covers more disciplines than Web of Science, Google Scholar, and PubMed (Falagas et al., 2008). The systematic search was built upon three thematic keyword clusters: spatial movement, urban scale, and causal determinants. Inclusion criteria were strictly limited to peer-reviewed "Article" document types to ensure academic rigour.

The comprehensive search string was defined as:

TITLE-ABS-KEY (("dispersion" OR "centrifugal") AND ("agglomeration" OR "centripetal") AND ("city*" OR "urban") AND ("factor*" OR "force*" OR "driver*" OR "determinant*" OR "influence*" OR "cause*")) AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar")).

A targeted search of the Scopus database identified 382 potential studies on urban agglomeration, dispersion, polycentric growth, and settlement patterns. After another round of rigorous screening for clarity and methodological transparency, we selected 45 documents for the final synthesis (see Figure 4). From this process, we identified 54 distinct factors influencing agglomeration and dispersion, which were then grouped into eight overarching themes (see Figure 5).

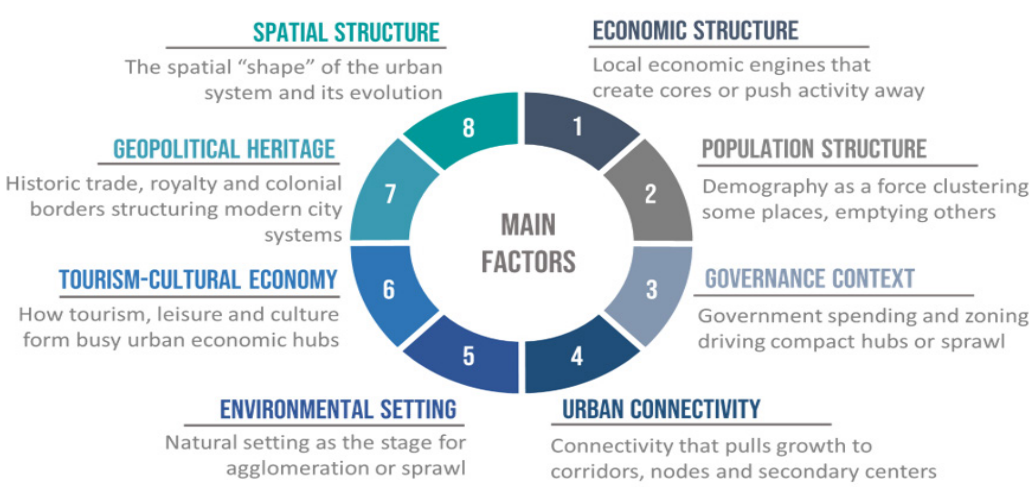
Figure 4: PRISMA flow diagram for the systematic literature review (SLR) process.



Source: Author's illustration

These studies cover a wide range of contexts, including large metropolitan regions, small towns, rural-urban fringes, and specialised economic corridors in cities worldwide. They span both advanced and emerging economies, as well as growing and shrinking city-regions. The research methods employed in these documents are equally diverse, ranging from econometric modelling, spatial statistics, and remote sensing to detailed case studies. All identified factors were coded and manually verified to preserve their original meaning before being synthesised into broader themes for this framework.

Figure 5: Eight main themes that influence the city's agglomeration and dispersion



Overview of Themes

Evidence from the 45 synthesised documents confirms that cities grow, stagnate, or spread out in response to recognisable forces operating through the economy, society, infrastructure, environment, institutions, and history. Variables such as GDP per capita, road density, housing prices, population age structure, and fiscal capacity are not isolated statistics. Instead, they act as specific transmission channels through which people, firms, and investors make locational decisions. By understanding these factors, policymakers can move beyond observing symptoms of urban change to address the root causes that determine whether a city clusters efficiently or disperses chaotically. Based on our SLR, we can distil these complexities into eight distinct themes. As detailed in Appendix I, each theme contains specific factors that act as levers for either agglomeration or dispersion.

Theme 1: Economic Structure

Economic structure acts as the primary engine of urban gravity, determining whether a city pulls activity in or lets it leak out. It is defined not just by a city's size, but also by how efficiently it generates wealth (productivity), its balance of industries such as manufacturing and services (sectoral mix), and its ability to innovate and remain competitive (dynamism). A strong, diversified economy creates a virtuous cycle in which high productivity and industrial intensity generate the jobs and funding needed for infrastructure (Zhong et al., 2025; Gu et al., 2023). This is reinforced by household consumption capacity, in which high spending power attracts shops and services to cluster, forming dense, vibrant urban cores (Dejun et al., 2025).

The physical layout of a city, such as high-rise office districts versus sprawling factory belts, is directly dictated by this economic activity. A service-based economy relies on face-to-face meetings and the fast flow of ideas, which keeps offices centralised in compact business districts (Qu et al., 2023). Conversely, as technology makes moving freight cheaper, factories no longer need to be near central ports. This leads to industrial relocation, where firms move to the periphery for cheaper land. Agglomeration can reverse through economic shrinkage or a ‘Siphoning Effect’, in which massive cities drain talent and capital from surrounding small towns, leaving them in long-term decline (Huang et al., 2020).

Theme 2: Population Structure

Population structure is not merely a background context but a direct driver of spatial patterns. It examines who lives in the city, its density, and residents' capacity to stay. A city’s ability to sustain agglomeration depends heavily on population vitality. Locations that attract a youthful and mobile workforce tend to innovate and grow. This reinforces the dominance of major metropolitan nodes (Pan et al., 2022). In contrast, ageing populations and very low densities act as powerful forces of dispersion. Shrinking towns often lose the critical mass needed to support essential services and infrastructure (Ciommi et al., 2020).

Household-related factors further shape settlement stability within the city. Financial resilience, such as access to savings, enables residents to weather economic shocks without migrating. However, exclusionary pressures have often pushed lower-income groups and young families toward the urban periphery. This includes high housing costs and redevelopment displacement, where urban renewal projects force existing residents to move out. The result is a scattered set-

tlement pattern in which housing is located far from jobs (Hou et al., 2024; Zhang et al., 2022); additionally, the concentration of human capital shapes social geography. Skilled workers tend to cluster in specific districts. This widens the gap between thriving city centres and struggling outer areas (Wang et al., 2025).

Theme 3: Governance

Governance is another factor that captures how public decisions actively steer development and determine where growth lands on the map. While economic and demographic forces provide the fuel for urbanisation, governance provides the steering mechanism. The literature highlights that government policies actively shape, rather than observe, urban outcomes. A government's ability to collect revenue and enforce zoning also determines whether a city becomes a compact engine of growth or a costly burden. Public revenue capacity becomes the decisive lever here. Strong financial resources allow authorities to invest in high-quality infrastructure that makes dense living liveable and attractive (Tian et al., 2025; Wang et al., 2025).

Conversely, the absence of effective governance in turn acts as a primary driver of inefficient dispersion. Weak land-use control can lead to failures in enforcing planning rules. This allows scattered, informal development to bypass protected areas and extend into agricultural lands, a process often called "leapfrog" development (Strano et al., 2021). This can create a disconnected urban form in which neighbourhoods lack proper links to the main city. This pattern typically consumes excessive land and is expensive to service. Ultimately, governance factors can determine whether a region achieves cohesive growth or locks itself into unmanaged sprawl.

Theme 4: Urban Connectivity

Urban connectivity defines a city's functional reach, encompassing the "wiring" of roads, rail, and utilities that link homes to jobs. Connectivity determines which locations are "within reach" and effectively part of the urban economy. Factors such as transport accessibility, corridors and strategic port locations create the physical skeleton for agglomeration. At the same time, smaller towns benefit from being near a major core, allowing them to access larger markets and jobs without bearing the full costs of density (Gu et al., 2023; Kassim et al., 2019). When these links are strong, isolated settlements transform into integrated regional networks with shared functions and labour pools.

However, connectivity has a breaking point. When infrastructure is overloaded, the benefits of access are outweighed by broader economic and social costs. Daily delays are just one example alongside reduced productivity, environmental degradation and higher logistical expenses. While some literature suggests transport congestion is the primary force pushing activity outward (Chen et al., 2021), contexts like Malaysia present a different reality. Intense pressure on core living infrastructure usually pushes residents to the periphery because of high housing costs and space constraints. Connectivity enables this outward sprawl. However, because employment remains centralised at the core, peripheral residents still face severe daily commuting congestion. Thus, the capacity and reliability of transit networks dictate whether a city functions as an integrated regional hub or suffers from fragmented sprawl. Continuous infrastructure investment is therefore essential to manage this outward growth and prevent congestion from choking the urban core.

Theme 5: Environmental Setting

The environmental setting forms the immutable stage upon which urbanisation plays out, comprising both natural geography and the environmental consequences of human activity. Favourable environmental conditions such as attractive landscapes and proximity to rivers naturally attract settlement. This creates dense clusters along scenic belts and fertile waterways (Hei et al., 2025; Li et al., 2024). In contrast, physical barriers like rugged terrain or limited flat land structurally constrain growth. This forces human settlements into small, scattered development patterns rather than large, connected areas.

As cities mature, human-induced environmental stressors often become the dominant drivers of spatial change. Urban heat accumulation and pollution pressure can severely degrade liveability in dense cores. The scarcity of natural assets, particularly urban canopy and trees, exacerbates surface heat. This microclimate effect increases cooling energy demand and severely restricts active mobility. Walking becomes uncomfortable or unfeasible, forcing residents to rely on vehicles even for leisure activities like visiting designated parks. This environmental degradation ultimately pushes residents and businesses to flee to greener peripheral zones (Tian et al., 2025). This outward movement manifests as construction sprawl, as the built environment expands into ecological lands to escape central congestion. Consequently, environmental quality is not just a backdrop but an active determinant of whether a city continues to densify or begins to disperse.

Theme 6: Tourism–Cultural

Cities are increasingly defined by consumption, leisure, and identity. This theme examines how tourism and culture create specialised economic clusters that often operate independently of traditional industrial zones. It focuses on the "experience economy" as a critical driver of spatial outcomes. Coined by Pine and Gilmore (1999), this concept refers to an economic stage in which value is generated by staging memorable, personal events rather than simply selling goods. For cities, this means competing not on industrial efficiency but on the unique cultural and lifestyle experiences they can offer, shifting planning focus from functionality to appeal and entertainment.

The literature highlights that cities with strong leisure and cultural assets tend to develop distinct, high-density districts that attract visitors, talent and investment. These "consumption cities", a concept popularised by Glaeser et al. (2000), grow primarily because they are attractive places to live and spend. By leveraging urban amenities such as theatres, restaurants, safety and architectural beauty, these cities attract high-human-capital workers. This creates a cycle where vibrancy itself acts as the economic engine (Dejun et al., 2025). However, a robust cultural economy requires more than just commercial venues. Accessible public spaces are equally critical. They give diverse groups room to experience and inhabit the urban environment adjacent to, or entirely independent of, formal consumption. Conversely, a lack of inclusive public amenities can leave a city culturally hollow. It will struggle to retain a diverse and skilled population even when industrial jobs are available.

Theme 7: Geopolitical Heritage

City growth is path-dependent; current locations often reflect past power structures as much as present-day efficiency. Geopolitical Heritage explains how historical legacies such as the location of royal courts, colonial trade routes, or strategic ports create a "stickiness" that sustains urban density for centuries. Factors such as Cultural Heritage Concentration and Royal Political Centrality explain why historic capitals retain their dominance long after their original strategic imperatives have faded. For instance, Kyoto in Japan remains a major demographic and cultural anchor despite losing its status as Japan's political capital to Tokyo over 150 years ago; its historical weight continues to attract tourism and shape identity (Sorensen, 2002).

However, history can also drive dispersion. Geopolitical fragmentation refers to the way political decisions or borders divide previously unified regions. A prime example is the Partition of India in 1947, which severed the economic arteries connecting Lahore and Amritsar. Once twin cities in a unified Punjab, they were split into competing border cities, forcing the development of duplicate infrastructure and dispersing regional growth (Talbot, 2010). Additionally, the risk of conflict acts as a powerful centrifugal force. The Syrian Civil War vividly demonstrates this, where the destruction of historic cores like Aleppo forced the population to scatter into peri-urban zones, refugee camps and secondary towns, radically altering the settlement map (Kaldor & Sassen, 2020).

Theme 8: Spatial Structure (The Internal Logic of Urban Form)

Finally, spatial structure examines the patterns and rules that govern how a city grows (or shrinks). Unlike economic or demographic themes, which focus on the "why", this theme focuses on the "where", the geometric layout of concentration and distribution. Agglomeration economies drive it by providing efficiency gains (sharing, matching, learning) that pull activity inward, forming dense clusters (Wu et al., 2025). Understanding these mechanics is crucial for predicting whether a city will evolve into a compact unit or a sprawled network.

As cities scale up, they often shift to a polycentric structure. This means the city shifts from having a single core to a network of multiple centres that share the functional load, often driven by congestion in the primary central business district (Volgmann & Münter, 2018). The neighbourhood attraction parameter describes the trajectory of this growth. This concept measures how strongly new development "sticks" to existing built-up areas. Strong attraction leads to compact, connected growth, whereas weak attraction results in "leapfrog" patterns of growth, in which new developments jump over empty land, creating fragmented sprawl (Strano et al., 2021).

Implications for The Malaysian Context

While the eight themes extracted from the systematic review represent global urban dynamics, they are deeply relevant to Malaysian cities. Macroeconomic shifts and transitioning spatial structures are clearly evident in the Klang Valley as it evolves from a single core into a polycentric region. This outward expansion is driven largely by demographic constraints and severe housing unaffordability in the core. These pressures push middle- and lower-income populations toward the periphery. Urban governance frequently struggles to coordinate cohesive planning across fragmented municipal borders. As a result, outward residential sprawl outpaces transit capacity. Residents remain dependent on centralised employment cores and face severe commuting

congestion. Local environmental stressors like tropical heat accumulation and flash flood risks further exacerbate the hostility of dense concrete cores. Conversely, cities like George Town and Melaka demonstrate the power of geopolitical heritage and tourism. They leverage historical appeal and urban amenities to sustain economic vibrancy without relying on massive industrial bases. Understanding how these global levers operate locally is essential to benchmarking the future resilience of Malaysian urban centres.

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Chapter 4: Cities Benchmarking

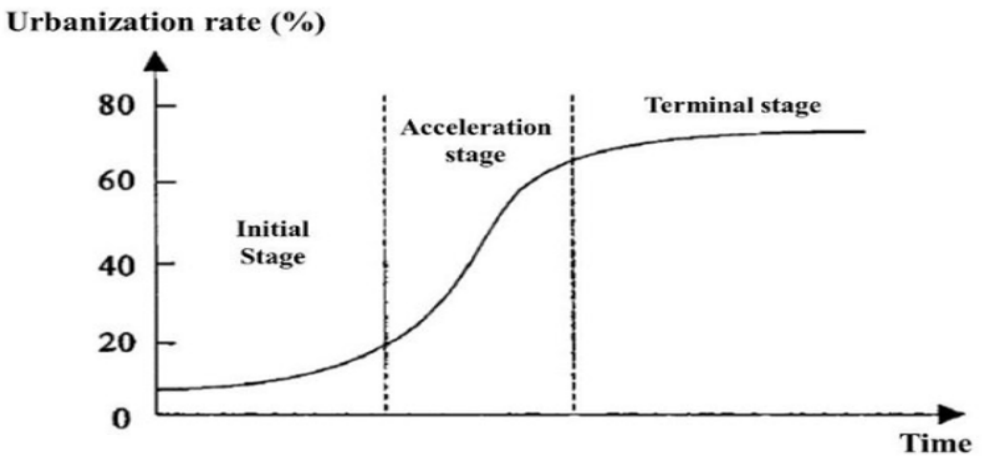
While previous chapters examined spatial patterns and the factors influencing agglomeration and dispersion, this chapter shifts the analytical focus from identification to rigorous diagnosis. To accurately understand the status and future direction of Malaysia's cities, it is necessary to benchmark them against global peers that have already navigated similar developmental paths. Benchmarking provides a highly structured, evidence-based framework for assessing whether current domestic development trajectories genuinely align with long-term policy objectives. By observing the historical and spatial evolution of these international counterparts ("lifecycle approach"), planners can identify the specific catalysts that will accelerate sustainable growth from those that will trigger urban dysfunctionality. This lifecycle approach clarifies a city's natural evolution, making the forces shaping today's urban landscapes clearer and more logical for a broader audience.

However, comparing global cities based solely on static administrative population sizes or gross domestic product cannot fundamentally provide a complete or true picture. Research by the World Bank (2015) emphasises that interventions must be tailored to a city's specific functional typology, such as distinguishing between market towns and production centres, rather than relying on mere scale. Similarly, the OECD (2020) highlights the inherent flaws in relying solely on administrative boundaries, advocating instead for a more functional perspective when mapping cities onto the accurate urban development stage across the globe. This shows how cities with identical economic outputs can face entirely different structural realities shaped by their stage of development. For instance, where a rapidly growing industrial city would typically struggle with housing shortages and traffic congestion, a mature post-industrial metropolis would, in stark contrast, be more likely to face systemic challenges relating to a rapidly ageing workforce and the costly need to revitalise older districts.

The Inverted U-Curve of Urbanisation

To map this developmental lifecycle, this analysis utilises the Inverted U-Curve of Urbanisation, a robust theoretical framework that predicts how cities evolve. This model synthesises two foundational theories in economic geography to explain the relationship between the pace of demographic growth and a city's physical shape. The first component, concerning the pace of growth, relies on Northam's (1979) S-Curve of urbanisation. This theory establishes that urban growth is not linear; instead, it follows a logistic trajectory. In the initial Embryonic stage, growth remains slow and dispersed. However, as industrialisation takes hold, growth accelerates explosively before eventually decelerating and saturating in the terminal stage. As illustrated in Figure 6, this S-Curve serves as the foundational demographic clock for our benchmarking analysis. It allows for a clear distinction between the rapid, structural migration currently witnessed in developing economies and the mature, stabilised demography of developed nations.

Figure 6: Northam's S-curve of urbanisation

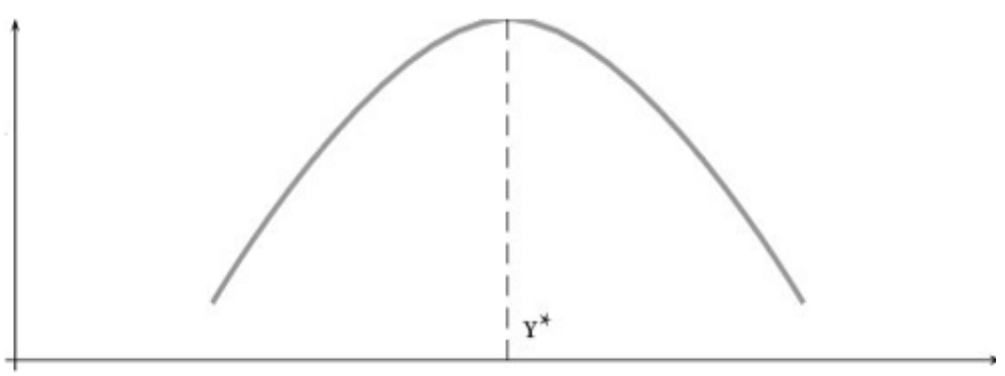


Source: Yi & Pei (2021)

While Northam describes speed, Williamson (1965) describes spatial distribution. His hypothesis posits that during early development stages, economic activity must concentrate in a single core or "primate city" to maximise efficiency. This leads to increasing regional inequality (the upward slope of the inverted U) (see Figure 7). However, as the economy matures, the negative externalities emanating from the core, such as congestion costs and high wages, would eventually outweigh the benefits of agglomeration.

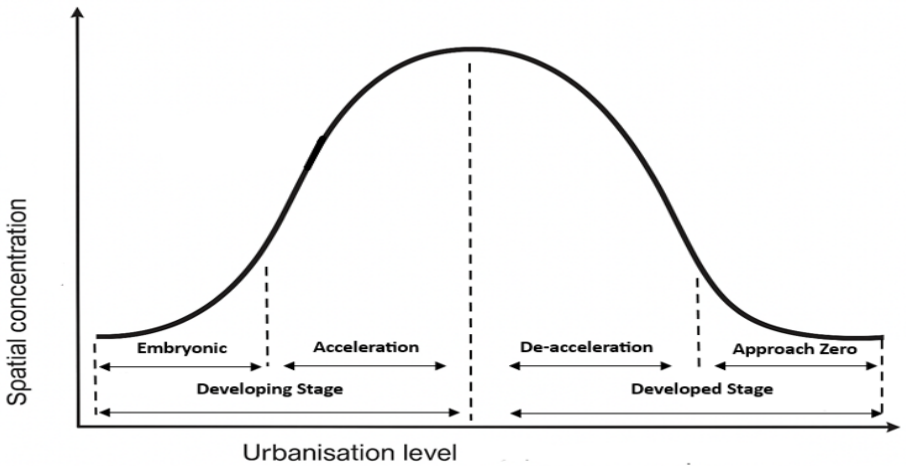
Growth then naturally spills over into peripheral regions, easing inequality (as shown by the downward slope). This provides the economic logic for why cities eventually disperse. There is thus this critical 'tipping point' that forces growth to naturally spill over into peripheral regions, effectively reducing inequality and forming the downward slope of the inverted U, as depicted in Figure 7.

Figure 7: The Williamson Curve



Source: Lackenbauer (2004)

Figure 8: Urbanization Stages



Source: Authors' own illustration adapted from Northam's (1979), Williamson (1965) and Zhou et al. (2021)

Recent research confirms that urban development follows a predictable "concentration-then-dispersion" trajectory. Zhou et al. (2021) analysed internal migration in China, demonstrating that migrant populations concentrate intensely in core cities during the acceleration phase to maximise efficiency, but eventually disperse into polycentric networks as regions mature. Complementing this, Zhong et al. (2022) found that while urban expansion initially widens the urban-rural income gap, it eventually narrows it once a city crosses a development threshold, confirming the existence of an inverted U-curve and its respective turning point. In the European context, Szörfi (2007) validated this pattern by comparing "new" and "old" EU member states. He found that regional disparities naturally peak in middle-income nations, driven by "growth poles" (such as Bratislava or Budapest), but diminish in wealthy nations as the diseconomies of agglomeration and institutional maturity drive convergence.

By overlaying Northam's classic three-stage model with the four-stage refinement proposed by Zhou et al. (2021), **this report identifies four distinct phases of the urban lifecycle.** These stages serve as the underlying structure for our benchmarking analysis (see Figure 8 and Table 4).

Table 4: Characteristics of the Urbanisation Stages

STAGE	POSITION ON CURVE	DEFINITION	KEY URBAN & SPATIAL CHARACTERISTICS	DOMINANT FORCE
Embryonic	Low urbanisation, low spatial concentration	Early phase of urban development, characterised by small, weakly differentiated cities and economic activities that remain largely dispersed. Urban systems are nascent and lack strong agglomeration dynamics.	· Predominantly agrarian or early industrial economy · Limited rural–urban migration · Small, fragmented urban centres · Weak infrastructure and institutional capacity · Low regional and inter-city inequality	Weak agglomeration

STAGE	POSITION ON CURVE	DEFINITION	KEY URBAN & SPATIAL CHARACTERISTICS	DOMINANT FORCE
Acceleration	Rising urbanisation, rapidly increasing concentration	Phase of rapid agglomeration driven by industrialisation and labour migration, where population, jobs, and capital concentrate strongly in core cities or urban agglomerations.	· Rapid economic growth and industrial expansion · Strong rural–urban and interregional migration · Dominance of primate cities or core metros · Rising housing pressure and infrastructure stress · Increasing spatial and regional inequality	Strong agglomeration
De-acceleration	High urbanisation, concentration growth slows.	The transitional phase in which agglomeration peaks and begins to weaken as congestion, high costs, and diseconomies reduce the attractiveness of core cities, prompting dispersion.	· Slowing growth of spatial concentration · High land, housing, and transport costs · Expansion of peri-urban areas and secondary cities · Emergence of polycentric urban structures · Diversifying migration patterns	Agglomeration dispersion
Approach Zero (Vision / Mature)	High urbanisation, stabilised or declining concentration	Mature stage of urban development where spatial inequality stabilises, or declines, and cities function as an integrated system with balanced growth across regions.	· Highly urbanised economy · Stable or declining spatial inequality · Strong secondary cities and regional networks · High-quality infrastructure and governance · Emphasis on liveability, sustainability, and resilience	Managed dispersion

Note: The definitions and characteristics outlined in Table 4 are synthesised from foundational and contemporary urban development research; Williamson, 1965; Northam, 1979; World Bank, 2015; OECD, 2020; Yi & Pei, 2021; Zhou et al., 2021.

The Domestic Baseline Profiles

This section establishes a comprehensive domestic baseline by diagnosing the urban lifecycles of key Malaysian city regions. A granular lifecycle approach reveals that Malaysia's metropolitan systems are distributed across highly divergent phases of spatial and economic maturation rather than following a uniform national trajectory. Chronological analysis of these profiles identifies the specific structural friction points that characterise the country's contemporary urban landscape, ranging from nascent resource retention challenges in emerging regional centres to late-stage agglomeration diseconomies in the capital. This domestic inventory provides the critical empirical anchor required to systematically align the subsequent international city archetypes with the operational realities of the Malaysian urban hierarchy.

Domestic Profile 1: Kuala Lumpur (Klang Valley), Malaysia

Kuala Lumpur serves as the primary domestic baseline, currently navigating the volatile tipping point between the Acceleration and Deceleration phases. During its Embryonic stage, the city functioned primarily as a colonial administrative and tin-mining centre (Kozlowski et al., 2017). The urban footprint remained highly compact around the confluence of the Klang and Gombak

rivers, with national urbanisation remaining exceptionally low at the time (Nayan et al., 2019). Agglomeration forces were relatively weak, driven primarily by raw material extraction and mercantile trade rather than mass industrialisation.

The city entered a rapid Acceleration stage following national independence and the implementation of state-led economic policies in the 1970s. The government actively centralized administrative power and industrial investments within the capital, triggering massive rural-to-urban migration and transforming Kuala Lumpur into the undisputed national primate city (Bunnell, 2002). To manage the initial demographic overflow, early satellite towns like Petaling Jaya were rapidly integrated into the expanding urban fabric. By the 1990s, massive infrastructural investments and a deliberate shift toward a knowledge economy supercharged the city's economic gravity, a transition actively managed through policy frameworks such as the 1984 Kuala Lumpur Structure Plan.

Today, Kuala Lumpur is experiencing the classic spatial frictions of the Deceleration phase. Having reached peak central agglomeration, the city faces severe diseconomies of scale. Extreme housing unaffordability and spatial constraints within the federal territory have forced a massive dispersion of middle and lower-income populations outward. This migration has transformed the traditional monocentric city into the sprawling, polycentric Klang Valley mega-region. Because formal employment remains highly centralized while residential growth sprawls outward, the region is plagued by severe daily commuting congestion. The phenomenon of horizontal urban expansion, which is more intensive at the suburbs than the city centre, proves that sprawl is a dominant trend of urban growth in the country (Yasin et al., 2022). Furthermore, while comparative regional data indicates that Kuala Lumpur's core urban green spaces have avoided the extreme structural fragmentation seen in neighbouring Southeast Asian capitals, the broader rapid expansion of peri-urban built-up areas across the wider valley has still fundamentally altered natural landscape connectivity (Nor et al., 2021). This massive reduction in natural drainage capacity, coupled with intensified tropical rainfall, has critically exacerbated the frequency and severity of urban flash floods across the region (Chan, 2012).

Domestic Profile 2: George Town and Seberang Perai, Malaysia

Penang represents a classic secondary-city archetype operating firmly within the late Acceleration phase, driven by specialised industrial clustering. During its Embryonic stage, the city functioned primarily as a colonial entrepôt and free port. The urban footprint was heavily concentrated on the eastern coast of Penang Island around George Town. Agglomeration forces were reliant on mercantile shipping and regional trade, with the mainland territory of Province Wellesley (now Seberang Perai) serving largely as an agricultural hinterland (Gin, 2015).

The transition into the Acceleration stage occurred abruptly in the 1970s. Following the revocation of its free port status, the state government aggressively pivoted toward export-oriented industrialisation (Koay, 2026). The establishment of free industrial zones attracted massive foreign direct investment, transforming Penang into a high-tech manufacturing hub anchored by the electrical and electronics (E&E) manufacturing sector (Gupta, 2026). This created a powerful centripetal force, concentrating high-value talent, capital and infrastructure heavily onto the island. This hyper-concentration eventually triggered severe agglomeration diseconomies, as the island’s finite geography reached its structural limits and catalysed skyrocketing land values. Currently, Penang is reaching the physical limits of its island-centric agglomeration. The state's

geography is characterised by protected hill lands, and the surrounding sea presents severe spatial constraints. Extreme land scarcity and skyrocketing property values on the island have forced a structural dispersion of residential and industrial development across the channel to Seberang Perai, such as the Batu Kawan Industrial Park. This has effectively transitioned Penang into a polycentric regional state. However, this cross-channel dispersion has placed immense strain on regional connectivity, leading to severe traffic bottlenecks. Furthermore, the expansion of built-up areas has put pressure on land and caused significant loss of agriculture land affecting the livelihood of the farming communities at the peri-urban area (Samat et al., 2014). The leapfrogging urban development to the suburbs has also become a substantial risk to environmental deterioration and traffic congestion.

Domestic Profile 3: Johor Bahru (Iskandar Malaysia), Malaysia

Johor Bahru presents a unique urban trajectory defined by cross-border spatial dynamics, currently operating in a hyper-Acceleration phase. During its Embryonic stage, the city functioned primarily as a border transit town and the administrative capital of a massive agricultural state. Growth was steady but relatively dispersed, functioning in the economic shadow of its sovereign neighbour, Singapore (Rizzo & Glasson, 2012). Agglomeration forces were relatively weak, relying on basic cross-border trade and the processing of hinterland commodities like rubber and palm oil (Pakiam et al., 2020).

The city's Acceleration stage was supercharged by state-led regional planning, culminating in the 2006 launch of Iskandar Malaysia (Rizzo & Glasson, 2012). This massive economic corridor was designed to attract foreign direct investment (FDI) and capitalize on the spillover effects of Singapore's constrained geography. The government injected massive capital into infrastructure and created specialized nodes, such as the administrative centre of Iskandar Puteri and the industrial hub of Pasir Gudang. This transformed Johor Bahru from a singular border town into a sprawling, multi-nodal economic region which draw significant internal migration and international investment.

Today, Johor Bahru faces the frictions of rapid, FDI-driven spatial sprawl. The aggressive expansion of the built environment and speculative construction methods have frequently outpaced localized demographic demand. This rapid urbanization has led to a low-density suburban sprawl extending into rural lands, exerting immense pressure on natural landscapes. Consequently, the city experiences a significant residential property overhang, particularly in high-rise and luxury developments.

This may indicate a stark mismatch between housing supply and actual local affordability. However, the impending realization of the Johor-Singapore Special Economic Zone (JS-SEZ) and the Rapid Transit System (RTS) link threaten to induce a secondary wave of hyper-agglomeration. The city is racing to integrate its sprawling sub-centres through public transit and smart city initiatives to prevent the extreme congestion associated with car-dependent regional sprawl. Ultimately, this cross-border integration repositions Johor Bahru as a primary co-engine of a unified, transnational metropolitan economy.

Domestic Profile 4: Emerging Regional Centres (e.g., Kuantan, Kuching, Kota Bharu)

While Malaysia's primary economic engines navigate the frictions of late-stage agglomeration, its secondary and tertiary regional capitals represent the Embryonic to early Acceleration phases. Historically, cities like Kota Bharu, Kuantan, and Kuching functioned primarily as administrative nodes or resource gateways for agricultural, timber and petrochemical commodities (Mohamed et al., 2024; Arzmi & Wahid, 2023). During this Embryonic stage, their urban footprints remained relatively dispersed, characterized by low-density development and a strong reliance on primary economic sectors rather than complex, export-oriented manufacturing.

The transition into the early Acceleration stage is currently being catalysed by massive national infrastructure integration projects, such as the East Coast Rail Link (ECRL) and the Pan Borneo Highway. These mega-projects are beginning to strengthen local agglomeration forces by significantly lowering logistics costs and improving regional connectivity (Athukorala & Narayanan, 2018). Furthermore, independent investigations into regional capacity building highlight that the strategic deployment of specialized hubs is increasingly vital to modernize regional infrastructure delivery and anchor high-value technical industries outside the primate city (Athukorala & Narayanan, 2018).

Despite these catalysts, these emerging centres currently face a critical spatial vulnerability, the "siphoning effect". Because they still lack the dense, mature knowledge economies of the Klang Valley or Penang, they frequently suffer from a continuous out-migration of young, educated talent migrating toward the primary metropolitan hubs. Their contemporary spatial challenge is therefore fundamentally different from Kuala Lumpur’s. Rather than managing severe congestion or massive property overhangs, they must strategically concentrate their limited development into highly compact, attractive nodes to generate enough localized economic gravity to retain capital and talent.

The Global Benchmarking Profiles

To accurately benchmark Malaysia’s current urban trajectory against these phases, eight global cities have been selected to represent key city archetypes. These cities were chosen because they perfectly encapsulate the extreme structural realities of specific lifecycle stages. For instance, Lagos was selected because it serves as the archetype of hyper-acceleration, while Bangkok and Jakarta represent the archetype of cities that are facing a critical transition from saturated primacy to forced dispersion. Conversely, Seoul, Tokyo, New York City, Winnipeg and Tampere offer diverse models of the Approach Zero phase, demonstrating how mature cities navigate deindustrialisation, ageing populations and the demand for high-quality infill. By mapping the eight themes influencing agglomeration and dispersion against these specific city profiles, those guiding urban development can clearly identify the policy levers necessary.

Global Profile 1: Seoul, South Korea

Seoul serves as the global prototype for "compressed urbanisation," having traversed the full spectrum of the urban lifecycle in less than a century. During its Embryonic stage, the city functioned primarily as a colonial administrative centre rather than a productive economic

engine. In the wake of the devastating Korean War, Seoul's infrastructure laid in ruins, and the national economy remained overwhelmingly agrarian. At this time, South Korea exhibited the classic markers of a pre-urban society, characterised by a Total Fertility Rate (TFR) that exceeded 5.0 and a crude birth rate of above 35 per 1,000 persons. The urban system was nascent, with the city's population of approximately 1.5 million largely composed of refugees and rural migrants residing in informal settlements. Weak agglomeration forces defined this era, as the capital lacked the industrial base required to sustain self-growth amid a vast rural landscape.

The transition to the Acceleration stage (1960s onwards) was triggered by state-led, export-oriented industrialisation, commonly referred to as the "Miracle on the Han River" (Bu, 2023; Cho & Kwon, 2021). During this phase, the government directed critical credit and infrastructure support toward chaebol conglomerates15, clustering heavy manufacturing and corporate headquarters within the capital. This created a powerful siphon effect[16], drawing capital and labour from across the nation and causing Seoul to grow with a staggering growth rate of new residents annually. By 1990, the city's population had reached 10 million, nearly 25% of the national total, thereby establishing an extreme level of Urban Primacy[17] (Joo, 2019; Chun & Kim, 2022; Shin & Timberlake, 2006). To manage this hyper-concentration, the state implemented aggressive spatial controls, such as the 1971 Greenbelt (Restricted Development Zone)[18] designation, and the massive development of the Gangnam district (Yeongdeong Project)[19] to relieve pressures on the historic core (Al-Bayati, 2023).

By the 1990s, Seoul reached the peak of the Inverted U-Curve and entered its Deceleration phase (1990–2015). Rising diseconomies of scale, including extreme congestion and skyrocketing land costs, began to force growth outward, transforming the city into a polycentric mega-region (Joo, 2019). Growth shifted towards the surrounding Gyeonggi Province, facilitated by the "Two Million Housing Construction Plan"[20], which established five major new towns connected by extensive metro rail extensions (Lee & Ahn, 2005; Min Joo, 2013). Concurrently, the capital de-industrialised, shifting its core focus to high-value services and the "Korean Wave"[21] cultural economy. This era marked a pivot toward qualitative renewal, famously exemplified by the 2005 Cheonggyecheon Restoration Project[22], which replaced an elevated highway with a linear park to revitalise the downtown (Robinson, 2011; Carrasco, 2024). The restoration reduced the urban heat island effect, increased biodiversity, and catalysed the revitalisation of the surrounding downtown business district.

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15 A chaebol (from the Korean 'chae' for wealth and 'bol' for clan) is a large-scale, family-controlled industrial conglomerate in South Korea. These entities are characterized by highly centralized ownership, management by founding dynasties, and a diversified structure of legally independent affiliates that collectively dominate the national economy.

16 The process by which a major urban centre draws economic resources, high-quality human capital, and investment away from smaller or neighbouring areas. While this accelerates growth in the central city through agglomeration, it often leads to regional disparities and the stagnation or decline of the surrounding regions.

17 Extreme concentration of where the largest city is significantly more than twice as large as the second-largest city. Dominating the nation's political, economic, and cultural life.

18 A state-imposed urban containment boundary established in 1971 around Seoul and other major cities. It strictly prohibited new construction in a ring approximately 10 km wide around Seoul, artificially capping the physical expansion of the historic city centre.

19 A state-led urban planning initiative launched in the 1970s to convert agricultural land south of the Han River into a new commercial and residential core. To force population dispersal from the overcrowded north. Banning new construction in the historic centre while providing tax breaks in Gangnam and controversially relocating prestigious high schools and government offices to the new district.

20 A national housing supply initiative launched by the Roh Tae-woo administration to combat severe housing shortages and soaring property prices. The plan successfully delivered over 2.1 million units in just five years, primarily through the development of five "First-Generation" New Towns in Gyeonggi Province: Bundang, Ilsan, Pyeongchon, Sanbon, and Joongdong. These high-density apartment complexes were linked to Seoul via extensive metro rail extensions, effectively shifting the metropolitan population outward.

21 Shifting to culture following the 1997 financial crisis, the government actively pivoted from manufacturing to a "soft power" strategy. Investing heavily in the "Korean Wave" (Hallyu) as a high-value export sector.

22 This project dismantled a 1970s elevated highway to uncover the historic Cheonggyecheon stream, transforming it into a 5.8km linear park. It is cited as a global example of removing "gray" infrastructure to restore "green" urban space.

Currently, Seoul is navigating the Approach Zero stage (2015–Present), where the strategic focus has pivoted toward urban regeneration and resilience amid severe demographic contraction. For years, South Korea has become as a global cautionary tale with the TFR[23] dropping below 0.72, the lowest in the world, leading to a shrinking workforce and hollowed-out school districts (Hwang et al., 2024; Kim & Han, 2023). However, recent data highlights a critical, policy-driven inflection point which sparked a notable turnaround. The national TFR back to 0.80 by 2025 and sustaining over two straight years of continuous, year-on-year growth in births (KOSIS, 2025). While the prevailing planning paradigm must still shifted toward "compact city" strategies, densifying transit nodes and retrofitting existing infrastructure via "age-friendly city" initiatives to support its legacy elderly population. Seoul must shift focus from merely managing terminal contraction to dynamically right-sizing and stabilizing services that actively nurture its nascent demographic recovery.

Takeaway:
Seoul demonstrates that compressed hyper-acceleration requires a rapid proactive pivot toward qualitative urban maturity. The city reached its spatial and infrastructural "point of no return" approximately two decades ago. In response the state aggressively reoriented mobility toward public transit. It heavily penalized private car usage and systematically converted vehicular infrastructure back into high-value public spaces. Seoul serves as a critical blueprint for emerging cities. It proves that avoiding unmanaged sprawl requires an uncompromising state-led pivot toward transit-oriented re-densification before central agglomeration collapses.

Global Profile 2: Tokyo, Japan

Tokyo stands as the global prototype for the mature mega-region. It shows how a city can successfully transition from a single industrial core into a vast service economy before finally adapting to a post-growth model. (Tokyo Metropolitan Government, 2021). In earlier times, Tokyo served as the political capital of an industrialising empire during its Embryonic stage (roughly pre-1950s). The national urban system remained partially agricultural at the time. Tokyo did not experience uninterrupted early growth. Instead, catastrophic shocks such as the 1923 Great Kantō Earthquake and World War II repeatedly destroyed its physical infrastructure (Sorensen, 2002). The "Imperial Capital Reconstruction Plan"[24] in the 1920s laid a modernized street grid. However, the city's buildings remained mostly low-rise. Japan's urbanisation rate hovered around 37% in 1950 (World Bank, 2023). The capital operated with weak agglomeration forces as the nation focused on basic post-war survival.

Japan entered its famous economic miracle in the mid-1950s. This pushed Tokyo into a volatile Acceleration stage (1950s–late 1970s). Tokyo became the undisputed command centre for a national manufacturing boom. Millions of rural migrants moved into the Kantō plain to staff new factories and corporate offices (Sorensen, 2002). The 1964 Tokyo Olympics physically catalysed this era of strong agglomeration. The state poured massive investments into infrastructure like the Shinkansen bullet train and the Metropolitan Expressway.

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23 Total Fertility Rate (TFR): The average number of children a woman is expected to have in her lifetime. A TFR of 2.1 is required for replacement-level population stability. This demographic cliff marks the transition to a Super-Aged Society, defined by the UN as a nation where 20% or more of the population is aged 65 or older.

24 Imperial Capital Reconstruction Plan (Teito Fukkō Keikaku). A visionary urban planning initiative launched following the 1923 Great Kantō Earthquake to transform Tokyo into a modern, resilient metropolis. Spearheaded by Home Minister and former Tokyo Mayor Gotō Shinpei, the plan introduced Japan's first large-scale application of land readjustment, which rationalized irregular medieval street patterns across nearly 90% of the fire-damaged area.

This relentless pursuit of economic efficiency soon created severe problems (Machimura, 1992). Heavy industry concentrated along Tokyo Bay while corporate headquarters crowded into the Marunouchi district. This led to extreme pollution, housing shortages, and crushing commuter traffic (Waley, 2007).

Tokyo reached the peak of the Inverted U-Curve during the Deceleration phase (1980s–1990s). The physical limits of a single urban core forced a massive spatial reorganisation. Planners actively engineered a polycentric city structure to intercept commuters and relieve pressure on the historic centre (Waley, 2007). They systematically upgraded major transit hubs like Shinjuku, Shibuya, and Ikebukuro into vital commercial sub-centres (Tokyo Metropolitan Government, 2021). The core simultaneously de-industrialised and shifted its focus to serve the global financial markets. The 1980s asset bubble[25] generated hyper-inflated land prices which pushed residential development outward along railway lines into neighbouring prefectures like Saitama, Chiba and Kanagawa. This managed dispersion permanently transformed Tokyo from a bounded primate city into the world's largest integrated mega-region (Waley, 2007).

Today, Tokyo operates deep within the Approach Zero stage (2000s–Present). This era is defined by demographic stagnation and a super-aged society. Japan's national population has been declining since 2008. Tokyo's TFR now hovers near 1.1 (OECD, 2016). The strategic focus has therefore shifted entirely from managing the speed of growth to managing the speed of contraction. The Tokyo Metropolitan Government is executing a Compact City strategy. This policy actively encourages residents to move back around major transit nodes to ensure efficient healthcare and public service delivery (Tokyo Metropolitan Government, 2021). Tokyo has also successfully pivoted towards a robust tourism and cultural economy to offset its shrinking industrial workforce. The modern objective for Tokyo is sustainable peripheral downsizing paired with qualitative core densification.

Takeaway:
Tokyo proves that escaping the crushing congestion of a hyper-concentrated mega-region requires state-engineered polycentricity rather than passive market-led dispersion. By systematically building transit-anchored sub-centres, the city successfully redistributed its massive economic weight to intercept commuter flows. For developing megacities, Tokyo provides the ultimate blueprint for retrofitting a sprawling metropolitan footprint into a highly efficient, post-growth "Compact City" equipped for a super-aged society.

Global Profile 3: Bangkok, Thailand

Bangkok represents a distinctively Asian urbanisation model. It is the ultimate extreme primate city. Bangkok dominates its national urban hierarchy to an unparalleled degree. Historians and economists frequently cite the capital as being substantially larger than Thailand's second-tier cities (Dixon, 1999). The city served as a colonial-era trading port and royal centre during its Embryonic stage (~1900–1960). It was famously known as the "Venice of the East". The city grew organically along its complex canal networks and the Chao Phraya River.

25 A financial cycle where excessive speculative investment drives asset prices such as stocks, real estate, or commodities to levels that cannot be justified by underlying economic fundamentals. A bubble is only confirmed retrospectively when it "bursts," leading to a sudden, severe price contraction and often triggering broader economic distress or recession

National urbanisation remained extremely low during this period (World Bank, 2023). The 1960 Litchfield Plan[26] marked a permanent structural turning point for Bangkok (Ross, 2000). This US-influenced master plan prioritised road construction over canals, setting the stage for a car-centric future that destroyed natural drainage waterways. The city possessed weak agglomeration forces at this time. It acted as a political centre but lacked a strong industrial engine.

Thailand shifted to export-oriented industrialisation in the 1960s. This launched Bangkok into a volatile Acceleration stage (1960–1997). Bangkok became the exclusive national gateway for foreign direct investments (FDIs). This created a massive suction effect, where millions of labourers migrated from the rural Northeast region to the capital (Glassman, 2009). The city expanded aggressively into surrounding rice paddies, creating a chaotic "desakota" landscape (Mcgee, 1991). This term describes a uniquely Asian mix of factories and agriculture clashing on the urban fringe. The government developed the Eastern Seaboard in the 1980s, which turned the region into a global manufacturing hub. However, the infrastructure completely failed to keep pace with population growth. Severe traffic congestion and extreme environmental degradation followed. Paving structures built over the canals by now had effectively sealed off a rapidly sinking delta underneath.

The 1997 Asian Financial Crisis[27] abruptly triggered the Deceleration phase (1997–2020). The speculative real estate bubble burst, forcing a shift from sheer quantitative growth to qualitative structural reorganisation (Glassman, 2009). The city finally rolled out modern mass transit systems. The BTS Skytrain rail lines opened in 1999, immediately inflating land values. The sky train anchored high-density condominium clusters, creating a more polycentric urban form. The urban core transitioned from a factory-based to a service-dominated economy. Routine manufacturing moved to the periphery. The devastating 2011 mega-floods[28] exposed the severe vulnerability of this unmanaged urban sprawl (Marks, 2015). Growth began slowing down in the inner districts, while the Bangkok Metropolitan Region expanded outwards into neighbouring provinces like Nonthaburi and Samut Prakan to form a continuous urban carpet.

Bangkok is now facing the Approach Zero phase (2020–Present). The city faces a severe dual squeeze. It must manage a shrinking demographic base alongside rising climate risks. Thailand is aging faster than almost any other developing economy. It will officially reach "super-aged" status by the early 2030s (United Nations Population Fund, 2011). The influx of young rural migrants has stalled so the city must now rely heavily on international labour and automation. Policy direction has urgently been shifting towards urban regeneration. Initiatives like the Charoen Krung Creative District[29] aim to attract high-value cultural tourism.

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26 The first formal master plan for Bangkok, commissioned by the Ministry of Interior and developed by the American consulting firm Litchfield Whiting Bowne & Associates. Released in 1960, the plan was designed to guide the city's growth through the year 2533 B.E. (1990 C.E.). It proposed a monocentric urban model characterized by a clear hierarchy of roads, designated land-use zones, and a "Green Belt" to restrict urban sprawl. While many of its core infrastructure recommendations, such as the creation of major arterial roads were implemented, the lack of strict zoning enforcement eventually led to the "ribbon development" and severe congestion that define modern Bangkok's landscape

27 A period of severe financial turmoil that began in July 1997, often referred to as the "Asian Contagion". Triggered by the collapse of the Thai baht after the government was forced to abandon its U.S. dollar peg due to a lack of foreign reserves, the crisis rapidly spread to other Asian country including Indonesia, South Korea, and Malaysia

28 Part of Thailand's most devastating natural disaster in modern history, triggered by record-breaking monsoon rains and five consecutive tropical storms. Inundation lasted from July to December, affecting over 13 million people and causing approximately 815 deaths nationwide.

29 Thailand's first official creative district, established as a "prototype" for urban rejuvenation through the creative economy. The project utilizes the area's multicultural heritage and existing clusters, particularly the jewellery and accessories trade, which accounts of many local creative businesses, to drive "soft" urban renewal.

The government is also pushing the Eastern Economic Corridor (EEC)[30] initiative, seeking to disperse industrial growth away from the capital.

Takeaway:
Bangkok serves as a stark warning of rapid agglomeration occurring on a vulnerable delta geography. The sheer physical weight of unmanaged concrete sprawl, combined with historical groundwater extraction, has caused severe land subsidence and critically exacerbated urban flash flooding. Bangkok proves that spatial planning must rigorously respect environmental carrying capacities before unmanaged concrete density permanently compromises natural drainage and regional liveability.

Global Profile 4: Lagos, Nigeria

The traditional rule of city-building assumes that demographic growth strictly follows industrial wealth. In cities like Seoul and Tokyo, the government-built factories and infrastructure, and the population followed. However, applying this Western rulebook to the Global South reveals a major exception (Fox, 2012). Cities like Lagos experience a phenomenon urban economists call "urbanisation without industrialisation". Instead of people migrating for formal factory jobs, the population explodes simply due to high national birth rates and a relentless search for basic survival. This creates a massive structural mismatch. The city's population grows at the rapid, chaotic pace of the Acceleration Phase (Stage 2). Simultaneously, its physical footprint sprawls out into the Deceleration Phase (Stage 3). The city is forced to expand before it has the wealth to build proper roads, transit, or formal housing. The following profile of Lagos illustrates this "hybrid" reality.

Lagos presents a highly complex urban anomaly that breaks traditional lifecycle models. The city experiences massive population growth without a corresponding rise in formal manufacturing jobs (Fox, 2012). The Embryonic stage (around 1900–1960) spanned its origins as a coastal settlement to the early post-colonial period. Lagos functioned primarily as a node in the global trading network. It served as a gateway for agricultural commerce rather than a centre of industrial production (Hopkins, 2020). The population remained well under one million by 1960. The urban footprint was mostly confined to Lagos Island. The economy was administrative and mercantile.

Nigeria's independence in 1960 launched Lagos into a volatile Acceleration stage (1960–1990). The 1970s oil boom acted as a supercharger for massive demographic agglomeration. Petrodollars flooded the capital and attracted labour from across West Africa. This created a severe siphon effect that drained talent from secondary Nigerian cities (World Bank Group, 2025). The formal infrastructure quickly collapsed under the weight of this mass migration. The state eventually attempted to force a deceleration by moving the federal capital to Abuja in 1991. The explicit political goal was to decongest the overcrowded coast. This administrative intervention completely failed to halt the economic gravity of Lagos. Major banks and corporations refused to relocate.

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30 A flagship special economic zone (SEZ) established in 2017 as part of the Thailand 4.0 strategy to transform the country into a value-based, innovation-driven economy. Spanning three eastern provinces; Chonburi, Rayong, and Chachoengsao. The initiative targets high-tech industries, including next-generation automotive, robotics, aviation, and digital technologies.27 A period of severe financial turmoil that began in July 1997, often referred to as the "Asian Contagion". Triggered by the collapse of the Thai baht after the government was forced to abandon its U.S. dollar peg due to a lack of foreign reserves, the crisis rapidly spread to other Asian country including Indonesia, South Korea, and Malaysia

Lagos has now entered a Hybrid Deceleration phase (1990–Present). Demographically, the city is still accelerating. It absorbs many new residents daily, driven by a massive national youth bulge (United Nations, 2018). Spatially, the city has been forced into chaotic dispersion. The physical limits of Lagos State have been completely breached. The city is currently sprawling massively into neighbouring Ogun State to form a continuous urban corridor (Adelekan, 2010). This creates a fragmented mega-region. The public realm has largely retreated in a process known as "anti-planning" (Gandy, 2006). Informal systems like the Danfo minibus networks now fill the massive infrastructure void. The economic pull factors of the informal economy completely overpower the push factors of extreme traffic and environmental degradation.

Lagos remains far from the mature stability of the Approach Zero stage (Distant Vision). Local authorities have drafted the Lagos Resilience Strategy and the Lagos Climate Action Plan (Lagos State Government, 2020). These policy documents outline an ambitious vision to leapfrog into a high-tech smart city by 2050. They prioritize integrated transport and climate resilience to protect the highly vulnerable, sinking lagoon geography. However, this future vision contrasts sharply with current physical realities. Unregulated trans-state sprawl and massive infrastructure gaps continue to define the daily urban experience for the vast majority of residents (Gandy, 2006).

Takeaway:
Lagos illustrates the absolute limits of applying standard Western urban models to the Global South. It proves that a city can be forced into spatial dispersion (Stage 3) by sheer overcrowding, even if its economy remains highly informal. For policymakers, Lagos shows that managing a mega-region requires cross-border governance rather than just local municipal planning.

Global Profile 5: Pirkanmaa (Tampere), Finland

Pirkanmaa is centred on the city of Tampere. It offers a compelling case of a "second tier" city-region. These are urban areas outside the national capital that possess substantial economic and functional independence (Hodos, 2011). Tampere successfully navigated a massive transition from heavy industry to a knowledge economy. The city operated as the "Manchester of the North"[31] during its Embryonic stage (around 1900–1950). Finland was largely rural at the time. However, Tampere was already a dense industrial node powered by the Tammerkoski rapids[32]. The economy was heavily dominated by the textile and metal industries, such as Finlayson and Tampella. The city functioned as a classic mill town. It was a specialised industrial island in a rural sea. The urban footprint remained compact and walkable. Regional connectivity was limited to freight rail, with negligible daily commuting from the hinterland[33].

31 The nickname is a comparative title given to cities that mirrored the rapid industrialization, textile dominance, and growth patterns of the world's first industrial city, Manchester, England.
32 A 945-metre-long channel in Tampere, Finland, and a designated Finnish National Landscape. The rapids' 18-metre vertical drop provided the hydropower that fuelled the city's 19th-century industrial boom, particularly the massive Finlayson cotton mills. Today, the surrounding red-brick industrial district is a protected heritage site and a candidate for the UNESCO World Heritage List, with most factories now repurposed into cultural hubs, museums, and residential lofts.
33 Refers to the surrounding inland region that is economically tied to a central city or port. While the city provides services and a market, the hinterland typically provides the raw materials, labour, and agricultural products.

Following World War II, Finland rapidly industrialised. This pushed Tampere into its Acceleration stage (1950–1985). The city became the primary growth pole for the Finnish interior. It absorbed a massive wave of rural migrants. The region experienced a significant "youth bulge". This demographic phenomenon occurs when a massive proportion of the population is between 15 and 29 years old, providing immense labour capacity (Urdal, 2006). The city expanded outward to house these workers. Planners built modernist suburbs like Hervanta that were detached from the traditional street grid. The Finnish welfare state consolidated during this era. The government funded major investments in hospitals, universities, and highways. Tampere solidified its status as a regional capital. However, spatial planning began to favour car-dependent sprawl.

The Deceleration phase (1985–2010) was defined by extreme structural rupture. The collapse of the Soviet Union in the early 1990s decimated Tampere's traditional heavy industry. This caused severe mass unemployment. However, the city rapidly pivoted to the knowledge economy (Kostiainen & Sotarauta, 2003). The meteoric rise of Nokia and the ICT sector completely offset the decline of smokestack industries. Tampere transformed into a global R&D hub. The urban core de-industrialised. Old factories were converted into museums and modern office spaces. Residential growth spilt over into neighbouring municipalities like Nokia, Ylöjärvi, and Kangasala. This created a functional travel-to-work area and marked the definitive shift to a polycentric city structure (Kostiainen & Sotarauta, 2003).

Pirkanmaa operates firmly within the Approach Zero stage (2010–Present). National fertility rates have plummeted to approximately 1.25 (Statistics Finland, 2023). The working-age population is actively shrinking. The strategic focus has shifted entirely from physical growth to economic vitality. The region has adopted a "Lifeboat Strategy"[34]. This planning approach recognises that peripheral areas will inevitably shrink. Planners, therefore, concentrate population and investment strictly into high-quality rail corridors to ensure survival (Tampere City Council, 2023). The 2021 Tampere Tramway serves as the spine for this densification. The city prioritises major urban regeneration projects over expansion. Planners are building Hiedanranta[35] as a circular economy district on an old factory site. They are also replacing a sewage plant with premium lakefront housing at Viinikanlahti. The ultimate goal is to create a "15-minute city"[36]. This concept is no longer just a lifestyle amenity. It is a critical economic survival tool. By offering hyper-convenient and highly liveable neighbourhoods, Tampere can attract international talent to directly offset its domestic demographic decline (Moreno et al., 2021).

Takeaway:
Tampere demonstrates that second-tier cities can survive the death of heavy industry by rapidly pivoting to a knowledge economy. For developing nations, it proves that "liveability" and "15-minute city" frameworks are not just luxury concepts. They are vital economic strategies for attracting global talent as national populations begin to shrink.

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34 A strategic urban planning paradigm adopted in the Tampere City Strategy 2030 (updated in the 2023–2025 implementation cycles) that prioritizes the survival of the urban core through hyper-densification. Recognising that peripheral, car-dependent districts are becoming economically unsustainable due to shrinking populations and rising maintenance costs, the city has mandated that 80% of all new residential construction be concentrated strictly within high-quality rail and tram corridors. This approach essentially treats the Light Rail and the Station District as "lifeboats". The only areas receiving significant infrastructure investment to ensure the region remains a vibrant, high-productivity hub while peripheral areas are managed for gradual contraction.

35 A 250-hectare former pulp mill site in Tampere, Finland, being transformed into a high-density innovation bay for 25,000 residents and 10,000 jobs. Designed as a circular economy district, the project integrates industrial heritage with resource-smart urban design, including local renewable energy production, carbon-neutral construction and the reuse of salvaged industrial materials. The district serves as a strategic testbed for the Sustainable Tampere 2030 Roadmap, prioritizing TOD along the new tram corridor to ensure long-term urban resilience and economic vitality.

36 The 15-minute city is a contemporary urban planning model where residents can access all essential daily services such as work, housing, food, health, education, and culture within a 15-minute walk or bicycle ride from their home. It advocates for a polycentric city composed of self-sufficient neighbourhoods, shifting the focus from high-speed vehicle mobility to hyper-proximity.

Global Profile 6: Jakarta, Indonesia

Jakarta represents a profound case of urbanisation pushed to its absolute physical limits. From an engineering perspective, every built environment has a maximum carrying capacity. Jakarta illustrates what happens when rapid urban densification catastrophically exceeds the capacity of the natural ecology and infrastructure to support it (Rukmana, 2022). During its Embryonic stage (around 1900–1950), Jakarta (then Batavia) served merely as the colonial administrative centre of the Dutch East Indies. National urbanisation remained extremely low in 1950. The economy was overwhelmingly agricultural. The city functioned primarily as a colonial port for the extraction of commodities such as rubber and spices. Industrial activity was minimal. The urban footprint remained small and highly segregated. The vast majority of the Indonesian population lived in rural hinterlands completely untouched by urban gravity.

Indonesia achieved independence in 1945. The subsequent rise of the highly centralised "New Order"[37] regime launched Jakarta into an explosive Acceleration stage (around 1950–1990). The government concentrated almost all industrial and financial investments in Java. This turned Jakarta into an undisputed primate city[38]. These policies created massive forces that pulled millions of migrants from across the archipelago. The population surged from roughly three million in 1960 to over eight million by 1990 (Firman, 1998). The city expanded rapidly outward. It absorbed surrounding traditional villages (kampungs) into the formal urban fabric. This massive spatial expansion officially established "Jabodetabek" (Jakarta, Bogor, Depok, Tangerang, and Bekasi). This newly created mega-region became the singular economic engine for the entire nation (Hudalah & Firman, 2012).

The core city of Jakarta began to physically saturate by the 1990s. The region entered a Deceleration phase (around 1990–2015). Population growth inside the central city limits slowed dramatically. Meanwhile, the outer periphery exploded. This marked a definitive spatial shift from a monocentric core to a vast polycentric region. Industrial estates and new towns flourished on the outskirts. Toll roads connected these new satellite nodes. The middle class heavily suburbanized. The urban core was left to high-value financial services, while low-income informal settlements remained. However, regional infrastructure completely failed to keep pace with this massive spatial expansion (Silver, 2011). This severe infrastructure deficit led to legendary traffic paralysis and systemic urban dysfunction. The friction of congestion simply forced growth outward into the wider metropolitan footprint.

Jakarta has now entered a unique and critical Approach Zero phase (2015–Present). This transition is driven by environmental survival rather than just demographics. The city faces an existential climate crisis. Severe groundwater extraction has caused catastrophic land subsidence. Jakarta is currently the fastest-sinking city in the world. Some northern areas sink up to 25 centimetres per year (Abidin et al., 2011). Nearly 40% of the city already sits below sea level.

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37 New Order (Orde Baru) was the authoritarian regime of Indonesia's second president, Suharto, which spanned from 1966 to 1998. Established in contrast to the "Old Order" of Sukarno, the regime prioritized political stability and rapid economic development over democratic participation. Under the guidance of Western-trained economists (the "Berkeley Mafia"), the New Order shifted Indonesia toward a pro-capitalist, export-oriented industrialization model, attracting massive foreign investment. In Jakarta, this era was characterized by discretionary urbanism, where high-speed infrastructure and modern commercial districts were built often through mass evictions to transform the capital into a global investment hub. The regime's legacy is defined by both an "economic miracle" and the entrenchment of crony capitalism, which eventually led to its collapse during the 1997 Asian Financial Crisis.

38 A concept first introduced by geographer Mark Jefferson (1939) to describe a city that is disproportionately larger than any other in its nation's urban hierarchy. A city is typically classified as "primate" if it is at least twice as large as the second-ranking city and functions as the primary hub for national identity, political power, and economic activity. In Southeast Asia, this phenomenon is often a legacy of colonialism, where a single port city was developed as the exclusive gateway for trade.

The government has opted for a radical "hard reset" to relieve the breach in carrying capacity. The 2022 State Capital Law officially formalised the relocation of the federal capital to Nusantara in East Kalimantan (Van de Vuurst & Escobar, 2020). This is a forced-dispersal strategy designed to actively deconcentrate the population from Java. For Jakarta itself, the future focus is strictly on urban regeneration. In this context, regeneration means engineering massive physical interventions to save the existing city from the ocean. Planners are designing the "Giant Sea Wall" to block the encroaching tides and improve flood resilience (Colven, 2017). Jakarta must physically retrofit its entire geography to survive as a commercial hub without its status as the political capital.

Takeaway:
Jakarta proves that urban agglomeration has a hard physical limit. If a city grows faster than its infrastructure and ecology can handle, it will literally collapse under its own weight. For developing nations, Jakarta is the ultimate warning that failing to manage spatial expansion eventually requires catastrophic and expensive national interventions.

Global Profile 7: New York City, USA

New York City (NYC) provides the ultimate historical benchmark for cities currently entering the Deceleration phase. It completed its primary urbanisation cycle decades ago. NYC demonstrates how a mature metropolis can survive severe de-industrialisation to re-emerge as a resilient global command centre (Glaeser, 2005). At the turn of the 20th century, NYC was already a colossus in its Embryonic stage (around 1900–1920). The broader United States was still transitioning from a rural economy. NYC functioned as the nation's primary industrial workshop and immigration gateway. The economy was heavily anchored by the shipping port and garment manufacturing. Mass immigration from Europe fuelled explosive density. The population grew from 3.4 million in 1900 to 5.6 million in 1920. This era was defined by the "tenement" housing model. Tenements are multi-story buildings with shared entrance stairways and heavily subdivided apartments (Plunz, 1990). This created extreme, unhealthy overcrowding in Lower Manhattan. Strong agglomeration forces drove this hyper-density because workers required physical proximity to the docks before the automobile era.

Between the World Wars, NYC entered its Acceleration stage (around 1920–1950). The city consolidated its absolute primacy. The US officially became a majority-urban nation around 1920. NYC's population climbed to its 20th-century peak of 7.9 million in 1950. This era saw the massive build-out of the subway system. Urban planner Robert Moses executed massive bridge and parkway projects that knitted the five boroughs into a unified metropolis (Glaeser, 2005). Manufacturing reached its absolute peak. The city became the undisputed headquarters of corporate America. It absorbed massive waves of labour from the American South and abroad.

NYC experienced severe trauma during its Deceleration phase (around 1950–1990). The city actually shrank. The population fell to 7 million by 1980 (United States Census Bureau, 2022). The construction of the Interstate Highway System facilitated massive suburbanization in New Jersey and Westchester. Manufacturing completely collapsed as factories moved overseas. This rapid de-industrialisation destroyed the municipal tax base. It culminated in the infamous fiscal crisis of 1975 when the city nearly went bankrupt (Fitch, 1993). This crisis exposed a critical flaw in municipal financial sustainability. A city cannot sustain high public welfare spending when its industrial tax base shrinks. The government was forced to adopt brutal measures and transition

to public-private financial models to survive. This dark period proved that urbanisation is not linear. Cities will physically decay if centrifugal dispersion overpowers the core's centripetal pull.

Since the 1990s, NYC has navigated the Approach Zero stage (1990–Present) by achieving a post-growth "Urban Equilibrium". In urban economics, equilibrium occurs when housing supply, transport capacity and land use balance perfectly to sustain economic output without requiring outward physical expansion (Anas & Liu, 2007). The population successfully rebounded to 8.8 million in 2020. The city completely abandoned low-value manufacturing. It reinvented itself as a hub for the FIRE economy (Finance, Insurance, Real Estate) and the technology sector (Fitch, 1993). Also, the strategic focus shifted entirely from physical expansion to climate resilience. Planners released PlaNYC in 2007 and OneNYC in 2015, milestone policy documents prioritise protecting the waterfront from rising seas and reducing carbon emissions (The City of New York, 2015). NYC proves that a city can thrive in the Approach Zero stage by constantly upgrading its economic value proposition. However, this market-driven rebirth relied heavily on aggressive neighbourhood re-zonings to spark high-density luxury developments. This triggered extreme gentrification across the boroughs. Skyrocketing property values displaced lower income populations and fundamentally altered the ethnic and political composition of the city.

Takeaway:
New York City proves that severe urban decay and industrial collapse are not permanent death sentences, but often the painful prerequisites for economic reinvention. It demonstrates how a mature metropolis can rebound from massive population loss by successfully upgrading its spatial footprint to support a high-value, post-industrial service economy. For maturing cities, NYC shows that reaching a resilient "Urban Equilibrium" requires constantly evolving the city's value proposition rather than relying on historical primacy. However, its post-growth equilibrium serves as a critical social warning for maturing regions like Penang. Unchecked luxury re-zonings and economic reinvention trigger extreme gentrification. This market-driven success displaces poorer populations and alters the social fabric of the city. For policymakers New York proves that economic rejuvenation must include strict affordable housing protections to prevent urban resilience from causing severe social exclusion.

Global Profile 8: Winnipeg, Canada

Winnipeg serves as a vital archetype of a "steady state" city. It is located in a mature, developed nation. It sharply contrasts with the explosive megacities of the Global South and the massive global command centres like New York. Winnipeg represents the trajectory of a mid-sized regional capital. It successfully transitioned from rapid resource-based expansion to a stable, diversified service economy.

Winnipeg was widely known as the "Chicago of the North"[39] during its Embryonic stage (around 1900–1945). It positioned itself as the undisputed "Gateway to the West". The city's fortune was tied exclusively to rail networks and grain logistics. It functioned as the vital funnel through which all east-west Canadian trade had to pass. This geographic monopoly created a rapid demographic boom. The population surged from roughly 42,000 in 1901 to nearly 300,000 by 1921 (Artibise, 1975). The city developed a dense, compact core centred on the historic Exchange District[40] and the massive rail yards. Strong agglomeration forces and the friction of distance tightly concentrated all economic activity within the city centre.

39 A moniker earned by Winnipeg during the late 19th and early 20th centuries, marking its status as Western Canada's primary gateway and industrial powerhouse. Much like Chicago, Winnipeg's growth was driven by its strategic location as a transcontinental railway hub. Its dominance in the global grain trade and its rapid transition from a frontier outpost to a major metropolitan centre.

Following World War II, Winnipeg entered its Acceleration phase (around 1945–1970). The city continued to grow. However, the spatial nature of that growth changed entirely. The city expanded rapidly outward into the surrounding prairie. The rise of the automobile and heavy investments in road infrastructure facilitated this modern suburban footprint. The construction of the Red River Floodway[41] in 1968 defined the environmental setting of this era (Manitoba Historical Society Archives, 2001). This massive earthmoving project protected the city from catastrophic flooding. It secured the city's long-term physical viability. However, it also safely enabled further low-density sprawl into previously flood-prone plains.

Winnipeg experienced a relative decline during its Deceleration phase (around 1970–2000). Its national dominance waned as the Canadian oil economy shifted wealth westward to cities like Calgary and Vancouver (Humphrys, 1984). Winnipeg's population growth slowed significantly. The city grew from 543,000 in 1971 to only 671,000 in 1996 (Government of Canada, 2022). The 1972 "Unicity"[42] amalgamation marked a radical governance experiment. The government legally merged the core city with its surrounding suburbs. The goal was to equalise the regional tax base and manage regional planning. However, this amalgamation coincided with a period of severe economic stagnation. The city faced classic "slow growth"[43] challenges. Maintaining sprawling infrastructure became a massive fiscal burden without a rapidly expanding tax base.

Today, Winnipeg exemplifies the Approach Zero stage (2000–Present) for a mid-sized city. It prioritises mature stability and qualitative growth over explosive expansion. Growth has returned to the city. This growth is driven by international immigration and a young Indigenous demographic rather than rural migration. The metropolitan population reached approximately 834,000 in 2021 (Government of Canada, 2022). The official policy focus is now codified in the Our Winnipeg 2045 development plan (City of Winnipeg, 2024). This plan heavily targets urban regeneration. The explicit goal is to direct 50% of all new growth into existing built-up areas to curb sprawl. The economy has successfully diversified into aerospace, advanced manufacturing, and finance. The Centre Port Canada inland port project actively leverages the city's geographic centrality for global logistics. The modern priority is densifying the core, reconciling with Indigenous peoples and adapting infrastructure for climate resilience.

Takeaway:
Winnipeg demonstrates that long-term municipal success does not always require the hyper-growth seen in global command centres. It provides a crucial template for mid-sized regional capitals navigating economic stagnation, showing that massive infrastructure burdens can be managed through bold governance interventions like regional amalgamation. For cities in low-growth environments, Winnipeg proves that stability is achieved by shifting the spatial focus from outward suburban sprawl to aggressive inward core regeneration.

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40 A 20-block National Historic Site in downtown Winnipeg, renowned as one of North America's most extensive and well-preserved collections of early 20th-century commercial architecture. Developed between 1880 and 1920, the district served as the financial and wholesale "gateway" to Western Canada. Housing the Winnipeg Grain Exchange and over 150 heritage buildings built in the Chicago School style. Its dense, walkable grid, characterized by massive stone and brick masonry warehouses were stands as a physical testament to Winnipeg's former status as the "Chicago of the North" before the opening of the Panama Canal shifted continental trade routes.

41 A massive civil engineering project initiated by Manitoba Premier Duff Roblin following the devastating 1950 Winnipeg flood. Completed in 1968, the 47-km channel involved the excavation of 76.5 million cubic metres of earth. It operates via a gate system south of the city that diverts excess water into a grass-lined channel, safely discharging it back into the river downstream at Lockport. Since its inception, the floodway has been used over 30 times, preventing an estimated $40 billion in cumulative flood damages.

42 A landmark urban governance reform that abolished Winnipeg's two-tier metropolitan system to create a single, unified municipal government.

43 A condition where a city's population and economic expansion occur at a rate significantly lower than the national average or that of peer cities, typically below 1% annually.

Comparative Synthesis: Strategic Benchmarks for Malaysia

Having established the domestic baseline and reviewed eight international peers a critical narrative emerges for Malaysia. The structural frictions mounting across the national metropolitan hierarchy are not isolated anomalies but predictable lifecycle transitions requiring immediate pre-emptive strategies. At the base of this urbanization curve, emerging regional centres like Kuantan and Kuching are working to cultivate local economic gravity. They constantly face the threat of losing local talent to the primate capital despite new national infrastructure links. To survive this siphoning effect these secondary cities can draw valuable lessons from the steady-state stability of Winnipeg and the targeted industrial clustering of Pirkanmaa. These global benchmarks demonstrate how smaller regional gateways can build self-sustaining economic cores without requiring primate-city scale. Moving up the steep slope of the curve Johor Bahru is currently experiencing a volatile hyper-acceleration phase. Driven by immense foreign direct investment and cross-border dynamics this rapid growth risks creating severe property overhangs and fragmented development. Successfully integrating its sprawling multi-nodal corridors relies on completely avoiding the car-dependent sprawl of early Bangkok. Instead, policymakers would benefit from adopting the early regional planning initiatives of Seoul. Implementing strict greenbelts and strategic new towns serves as a highly effective strategy to anchor foreign investment efficiently and prevent fragmented suburbanization.

Further along the urbanization lifecycle Penang is operating under severe spatial constraints as it nears the peak of the acceleration phase. The state faces a highly specific structural challenge. It requires a successful transition of its mature industrial base into a high-value knowledge economy without displacing its local population or destroying its peri-urban ecosystems. Penang's industrial transition aligns closely with Pirkanmaa which successfully navigated its own manufacturing maturity by pivoting toward a compact localized knowledge economy. Furthermore studying New York City provides policymakers in Penang with a blueprint for the proactive zoning and densification strategies required to manage intense real estate pressures on a spatially constrained island. However, the New York experience also offers a critical social warning. While upgrading a city's economic value proposition is necessary for survival unchecked luxury re-zonings and economic reinvention often trigger extreme gentrification. This market-driven success can easily displace poorer populations and permanently alter the social fabric of the historic city. Therefore, implementing strict affordable housing protections is vital to ensure that market-driven densification does not trigger demographic displacement. Industrial success cannot inadvertently lead to severe social exclusion and ecological degradation across the channel in Seberang Perai.

Sitting precisely at the volatile tipping point between acceleration and deceleration the Klang Valley faces the most urgent structural crisis in the nation. Immediate intervention from federal and regional governance is critical to avoid the unmanaged sprawl documented in Jakarta and the exacerbated flooding seen in Bangkok. The Bangkok trajectory serves as a direct cautionary tale for Kuala Lumpur. Continuous horizontal expansion has replaced critical greenbelts with a massive built environment. The sheer physical weight of this unmanaged concrete sprawl across the Klang Valley is severely sealing the topography and compromising natural drainage. This dangerous ecological trajectory directly mimics the vulnerabilities of Bangkok's subsiding delta. The Klang Valley is now facing a structural point of no return highly analogous to the crisis Seoul navigated twenty-five years ago. Escaping this central congestion relies on aggressive policies

that fundamentally mirror the Seoul trajectory. Planners are encouraged to disincentivize private car usage and reorient mobility entirely around public transit to prevent absolute infrastructural paralysis. By prioritizing state-engineered transit solutions and reclaiming urban space for public utility Kuala Lumpur can successfully transition toward a mature equilibrium. Escaping central diseconomies ultimately requires an uncompromising state-led pivot toward transit-oriented re-densification before central agglomeration collapses under its own physical weight.

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Chapter 5: Future research and policy pathways for emerging cities

The earlier chapters outline discussions that establish four key foundations that underpin our ongoing research into Malaysian cities, mainly from:

1. Policy analysis and Malaysia's development trajectory
2. Spatial patterns and changes based on real nighttime light (NTL) data
3. A conceptual framework for assessing the agglomeration and dispersion forces that shape cities, and
4. Comparative literature on city archetypes for benchmarking urban development.

There is a pressing need to examine the historical, ongoing, and future forces shaping Malaysia's urban form as we prepare to house 38 million, or 80% of Malaysians, in urban areas by 2030. Malaysia's urbanisation has increased significantly from 28.4% in 1970 to 75.1% in 2020. This transition was driven by structural economic changes in the 1970s, especially industrialisation, infrastructure development, and export-led growth, which boosted agglomeration economies and heightened spatial concentration in major cities. These changes have led to substantial growth in the labour force within cities, a phenomenon economists call **labour market pooling.** Notably, this transformation has occurred within a relatively compressed timeframe compared with several other cities, limiting our planning system's ability to adapt and keep pace with the scale and speed of urban change.

The SLR further shows that these transitions reinforce the concentration of economic activity in urban areas by attracting firms and labour. This pattern persists today and creates a self-reinforcing cycle of growth. At the same time, it creates a trade-off in people's decisions where rising costs, congestion, and environmental pressures eventually offset the benefits of concentration and push growth outward. Therefore, **spatial patterns should be understood not as the direct outcome of policy or planning design, but as the result of behavioural responses to underlying factors**, such as economic structure, connectivity, governance, and population dynamics, that shape how households, firms, and institutions navigate opportunities and challenges. As such, understanding these factors is critical to shaping urban outcomes effectively.

Despite continuous policy efforts to promote balanced territorial development through regional corridors and decentralisation strategies, growth continues to concentrate in major urban centres. Cities such as Kuala Lumpur, Penang, and Johor Bahru captured a disproportionate share of the population, investment, and economic activity, despite **ongoing national efforts to promote balanced territorial development.** Although regional development programmes and economic corridors were intended to reduce spatial disparities between these cities and other regions of Malaysia, outcomes were uneven, and most of these areas were unable to generate the desired levels of economic growth and prosperity.

Hill et al., (2020) and Ngah, (n.d.) explained several factors that limit the impact of Malaysia's corridor-based regional policies, partly reflecting their overly broad spatial scope, which diluted policy focus and allowed investment **to concentrate in already developed urban nodes. This aligns with our NTL analysis,** which similarly finds that **secondary cities or polycentric development have emerged naturally** in response to structural agglomeration dynamics rather than planned regional programmes.

Building on this, it is recommended that **future policy be reframed from "balanced territory" to "functional polycentricity"**. However, operationalising the shift requires moving from spatial redistribution to more connected urban systems, in which multiple centres function as a well-connected network through transport links, are economically interdependent, and are coordinated through governance structures.

The following key points demonstrate why it is crucial to examine how polycentric urban systems provide a more realistic and sustainable approach to managing spatial development and regional disparities:

i. **Balanced territorial development may be unrealistic under strong agglomeration forces.** The spatial patterns observed suggest that economic concentration arises primarily from structural agglomeration forces rather than policy design. These forces stem from firms' and workers' tendency to cluster geographically because of proximity to labour pooling, supplier linkages, and knowledge spillovers. These factors are considered structural as they are self-reinforcing and emerge from the fundamental functioning of the economic system.

ii. **Enhancing productivity via "scale borrowing" among sub-centres.** The spatial pattern extending from the core economic area to sub-areas demonstrates how these secondary areas serve as complementary growth poles to the existing urban cores. As the central hub becomes overloaded, these areas can accommodate population growth and diversify the economic structure, provided that sprawl is managed sustainably. Rather than creating new zones for economic opportunities, the core area's shared economic benefits enable sub-areas to access common market opportunities, knowledge exchange, and labour mobility. This trend was evident in the expansion of secondary cities such as Sungai Petani, Bandar Kulim, and Kepala Batas, which benefited from economic spillovers from Penang.

On those points, it is important to examine the conditions under which secondary cities can become viable economic centres that supplement dominant cities. According to Zhang et al., (2019), the conditions should enable the sub-area to progressively evolve into larger sub-areas and for economic activity to reorganise into multiple interconnected centres. Thus, connectivity factors are crucial because they determine which urban nodes are physically, functionally, and economically integrated into the city system. Connectivity is vital for the efficiency of the urban network, affecting accessibility between areas, people's mobility, and opportunities for economic growth. This is where the issue lies in the transportation system, **when urban demand outpaces the carrying capacity.**

Critiques of polycentric or sprawling development **often neglect the root issue of how such spatial patterns develop**. It is more accurately understood as an adaptive outcome of people's responses to current conditions, as explained by the factors influencing agglomeration and dispersion. This indicates that **cities' agglomeration and dispersion can be understood as**

an adaptive outcome of how households, firms, and institutions respond to the system's current incentives, including infrastructure, transportation and connectivity, economic (such as subsidies on transportation and housing), and governance conditions (including management of inward migration and management of public spaces). As cities grow and agglomeration diseconomies intensify, dispersion and polycentric restructuring emerge as efficiency-seeking adjustments. Whether these adaptations result in coordinated urban systems or fragmented sprawl ultimately depends on governance capacity and the ability to manage the shift from concentration to dispersion.

Benchmarking against global city experiences suggests that although many cities evolve from monocentric structures towards **polycentric systems, long-term success depends on achieving functional integration across these centres.** The evidence presented in this work indicates that this transition has yet to occur in Malaysia, even though the analysis shows that Malaysia has developed a polycentric urban structure without full integration.

Benchmarking findings highlight that polycentricity is not an end state but part of a broader transition that must be actively managed. The following insights from benchmarking illustrate how several cities have navigated this transition and the implications for Malaysia's pathway towards functional polycentricity:

i. **The inevitability of the polycentric shift.** Tokyo thrived by deliberately establishing sub-centres such as Shinjuku and Shibuya to address overcrowding, congestion, long commutes, and high economic density. This suggests that, rather than "stopping sprawl," **the objective for an area like Greater Kuala Lumpur should be to transform sprawl into a network of high-density nodes. The natural evolution from a "Primate City" to a "Mega-Region" requires metropolitan-scale governance alongside local municipal planning.**

ii. **The "compressed urbanisation" trap**. Lessons learned from Seoul's case reveal the reality of compressed urbanisation. The case from Seoul demonstrates how a city's urbanisation can occur too quickly, within approximately 60 years, unlike Western cities, which have developed gradually through multiple demographic and spatial stages. Seoul illustrates how its transformation is hindered by a structural mismatch between physical and demographic change. **For Malaysia, the warning is clear: we must shift toward qualitative, high-value economic structures before the demographic window closes, or we risk being "stuck" with infrastructure designed for a workforce that no longer exists.**

iii. **The "Approach Zero" Reality**. A city can remain economically vibrant even as its population declines or stagnates. Benchmarking insights show that several global cities have successfully reoriented their economic identities from traditional production-based models to consumption-, cultural-, and knowledge-driven hubs. This also suggests that cities can continue to function as production-focused industrial hubs by exploring opportunities in market, cultural, or experience-based economies. Therefore, **Malaysia needs to differentiate between cities that can serve as production-oriented industrial centres and those better suited to market/experience centres so it can apply the appropriate policy levers**

iv. **Between forced or managed dispersion.** The case of Jakarta and Tokyo illustrates two fundamentally different experiences of spatial dispersion. Jakarta underwent forced dispersal due to extreme environmental conditions, including land subsidence, chronic flooding, and severe congestion, prompting the relocation of Indonesia's administrative capital to address rising systemic risks. In contrast, Tokyo demonstrates managed dispersion forces by actively establishing a network of high-density sub-centres to intercept commuter flows and redistribute economic activity within the metropolitan area. **Malaysia must therefore choose whether its urban development is driven by crisis-driven, reactive dispersion or by a deliberate, plan-led polycentric approach anchored in transit-oriented development and metropolitan-scale governance.**

Insights and key findings in this report show that urban spatial patterns, such as polycentricity and dispersion, arise more from how households, firms, and institutions respond to existing system conditions than from deliberate planning. These observations highlight the crucial need for Malaysia to implement adaptable, polycentric, and high-value metropolitan systems driven by distinct city roles, demographic realities, and governance that works in tandem with, rather than against, the structural development of urban behaviours.

While this report provides insight into Malaysia's urban progression, **further research is required to address several critical gaps** in understanding how urban systems evolve and how policy can more effectively shape spatial outcomes.

i. **Understanding system interactions and how underlying factors interact with one another**. While this report identifies several factors that determine spatial outcomes, how these factors interact over time remains underexplored. Future research should examine these interactions rather than analysing each factor in isolation.

ii. **Measuring functional polycentricity.** Although this work provides evidence that Malaysia has developed a polycentric spatial structure, no framework currently assesses functional integration or the degree of connectivity and interdependence among the urban cores. Developing an indicator to measure commuting flows, accessibility levels, and economic linkages is important to evaluate whether the urban system operates as a cohesive network.

iii. **Improving measurements of urban activation**. The NTL data analysis shows a divergence between physical expansion and economic activity, indicating that growth is not always accompanied by efficient use of space. Future work should explore refining the measurement approach by integrating NTL or GIS with indicators such as occupancy rates, firm density, and energy consumption to better capture the intensity and quality of urban development.

iv. **Strengthening predictive modelling.** This gap concerns a limited understanding of spatial evolution. Although the current work provides insight into existing patterns, it is largely descriptive and does not fully explain how these patterns may evolve under different scenarios. A more advanced modelling approach, including spatio-temporal analysis, simulation models, and scenario-based planning tools, will help anticipate future urban dynamics.

v. **Understanding behavioural responses**. While this report shows that spatial outcomes are not directly determined by policy or planning design but instead emerge from how households, firms, and institutions respond to underlying factors, these behaviours remain underexplored. It is critical to understand how people manage trade-offs among factors such as cost, accessibility, and opportunity, and how these decisions collectively shape urban form over time.

vi. **Explaining corridor-based growth**. Urban expansion in Malaysia is increasingly shifting toward corridor development. The question raises concerns over the long-term implications of this pattern, which remain uncertain. Further work is needed to determine whether such developments can evolve into integrated urban systems or risk reinforcing spatial fragmentation if not properly managed.

vii. **Adopting a system-of-cities perspective**. There is a need to adopt a broader system-of-cities perspective. Much current work focuses only on individual metropolitan areas, with limited attention to how cities interact within the national urban system. In the future, it will be important to examine inter-city relationships, including labour mobility, investment flows, and economic specialisation, to better understand how national urban performance emerges from these interactions.

The gaps outlined above are not merely analytical but reveal fundamental limitations in the current policy frameworks governing Malaysia's urbanisation. The report therefore sets out the following targeted policy recommendations:

i. **Connecting the system through function integration**.

- Strengthening inter-node connectivity across multiple centres is essential to enable labour mobility, reduce congestion and improve economic coordination.

- Urban systems should be analysed using commuting flows and other functional linkages that extend beyond administrative boundaries. Connectivity should align with the spatial distribution of jobs, housing and economic clusters.

ii. **Activate existing urban space before further expansion**

- Malaysian cities do not face a shortage of development, but uneven utilisation of existing assets. The persistence of vacant buildings and housing, underused developments, and low-activity spaces reflects a mismatch between supply and demand.

- Rather than relying solely on expansion, policy should prioritise infill development, adaptive reuse, and measures to discourage prolonged vacancies. The challenge is to ensure the right development is delivered in the right locations for those who need it.

iii. Align jobs, housing, and mobility systems

- The spatial patterns inform how the separation of employment and residential choices contributes to long commutes and loss of productivity due to congestion.

- Integrating land use, transport, and economic planning will ensure better alignment of jobs, housing, and services. Improving transit-oriented development (TOD) by prioritising affordability and accessibility is critical.

iv. Strengthening economic-spatial alignment

- Spatial inequality shows where economic activity and capabilities are concentrated. It cannot be solved simply by redistributing space. Instead, it needs a coordinated approach that aligns economic strategies, investments, and planning to create complementary functions across a connected system of cities.

v. Improve coordination through metropolitan governance

- It is essential to go beyond administrative boundaries and enhance coordination among agencies and jurisdictions to align policies related to land use, transport, infrastructure, and economic development.

- A new approach to governance is required to establish metropolitan-level coordination mechanisms and to empower local authorities to implement place-based solutions, supported by stronger vertical and horizontal policy alignment.

vi. Shift toward behaviour-informed and demand-driven policy design

- Rational responses shape urban outcomes more than policy or planning failure. This suggests that future urban policies must move beyond prescriptive planning towards influencing behaviour that incorporates life-cycle needs, affordability constraints, and changing behaviour, such as work patterns, into decisions.

vii. From reactive response to anticipatory planning

- Policy remains largely reactive, focusing on symptoms after they appear and perpetuating long-term inefficiencies. To manage cities effectively, it is essential to forecast how economic, social, and spatial factors interact. This requires enhanced analytical skills, unified data, and scenario-planning tools.

In conclusion, this report highlights that Malaysia's urban challenges stem from systemic issues rather than isolated problems. Although cities have become more polycentric, the lack of functional integration continues to cause congestion, inefficiency, and spatial inequality. The key policy focus should shift from redistributing growth to realigning the fundamental systems that shape it, including jobs, housing, mobility, and governance. In the future, urban success will increasingly depend on how well cities operate as integrated systems, from spatial to functional polycentricity.

Glossary

Embryonic	The spatial concentration of population, firms, economic activity, and infrastructure within a specific geographic area, generating productivity and efficiency gains.
Agglomeration Economies	The economic benefits firms and workers obtain from proximity, including shared infrastructure, labour pooling, and knowledge spillovers.
Agglomeration Diseconomies	Negative effects of excessive concentration such as congestion, high costs, and environmental degradation.
Approach Zero (Mature Stage)	Final stage of urban development where growth stabilizes or declines, focusing on regeneration, resilience, and balanced systems.
Centrifugal Forces	Forces that push people and activities away from urban centers, causing dispersion.
Centripetal Forces	Forces that attract and concentrate people and activities in urban areas.
Cluster (Image Analysis)	A group of adjacent pixels sharing the same classification (e.g., high-intensity areas).
Cluster Morphology	The structure, size, and spatial arrangement of pixel clusters used to interpret urban form.
Compact City	An urban strategy promoting high-density, transit-oriented development to improve efficiency and sustainability.
Connectivity (Transport & Economic)	The degree to which places are linked through transport systems and economic interactions, enabling efficient movement of people, goods, services, and information.
Consumption City	City that grows through amenities, lifestyle and cultural attractiveness rather than production.
Corridor-Based Development	Urban growth that follows major transport routes such as highways, rail lines, or coastal corridors.
Cross-Border Urban System	A metropolitan structure influenced by economic and spatial interactions across national borders.
Dark Areas (NTL)	Very low brightness regions representing rural or undeveloped land.
Deceleration Stage	A phase where urban concentration peaks and begins to decline due to rising costs and congestion.
Decentralisation	The movement of population and economic activities away from central areas into surrounding regions.

Diseconomies of Scale	Negative effects like congestion and rising costs when cities become too large.
Dispersion	The spatial spreading of population and activities away from central areas into peripheral or lower-density zones.
Embryonic Stage	Early phase of urbanisation with dispersed settlements and weak infrastructure
Experience Economy	Economic model where value is created through experiences such as tourism and culture
Functional Typology	Classification of cities based on economic roles rather than size.
Functional Urban Area (FUA)	A geographic area defined by socio-economic linkages—such as commuting patterns and economic interactions—rather than administrative boundaries.
Geopolitical Fragmentation	Division of regions due to political boundaries disrupting spatial and economic cohesion.
Geopolitical Heritage	Historical legacies shaping present-day urban structure and development.
Geospatial Data	Spatially referenced data, often derived from GIS or remote sensing, used to analyse land use, urban expansion, and development patterns.
Growth Poles	Key economic centres that concentrate investment and activity, driving regional growth and potentially spreading benefits to surrounding areas.
Google Earth Engine (GEE)	A cloud-based geospatial platform used to process and analyse large-scale satellite datasets.
High Intensity (NTL)	Brightest pixels representing dense urban cores and areas of intense activity.
Housing Stress	A condition where households face financial strain due to high housing costs relative to income, often limiting their ability to meet other essential needs.
HSV Colour Model (Hue, Saturation, Value)	A colour classification system used in image processing to categorise pixel intensity and brightness.
Human Capital Concentration	Clustering of skilled individuals in specific urban locations.
Infrastructure Capacity	The ability of transport, utilities, and services to support urban demand.

Intensity Distribution	The proportion of pixels across different brightness categories within a study area.
Inverted U-Curve of Urbanisation	A model explaining how cities evolve from concentration to dispersion over time.
Largest Cluster Size	The size (in pixels) of the largest contiguous high-intensity cluster.
Leapfrog Development	Scattered development pattern skipping vacant land leading to fragmentation.
Local Towns (Bandar Tempatan)	Smaller urban settlements that provide services to local communities and surrounding rural areas.
Low Intensity (NTL)	Lower brightness areas associated with peri-urban zones.
Medium Intensity (NTL)	Moderately bright pixels indicating suburban, industrial, or built-up areas.
Monocentric City	A city structured around a single dominant core.
National Physical Plan (NPP)	Malaysia's national spatial planning framework that translates development policies into land use, infrastructure, and physical planning strategies.
National Urban Policy (NUP)	A coordinated set of government-led strategies and actions aimed at guiding sustainable, inclusive, and resilient urban development.
New Urban Agenda (NUA)	A global framework adopted by the United Nations to promote sustainable urbanisation through inclusive, safe, resilient, and well-planned cities.
Nighttime Light (NTL) Data	Satellite-derived data capturing artificial light emissions, used as a proxy for urbanisation and economic activity.
Peri-urbanisation	The expansion of urban development into rural fringe areas, often characterised by mixed land uses and rapid population growth.
Polycentric City Structure	Urban structure with multiple centres instead of a single core.
Polycentric Development	A spatial development approach where multiple urban centres within a region are developed and connected to promote balanced growth.

Primate City	A city significantly larger and more dominant than others in a country.
Regional Inequality	Disparities in economic development, infrastructure, and opportunities between different regions within a country.
S-Curve of Urbanisation	A model describing urban growth as slow, then rapid, then stabilised.
Siphoning Effect	Large cities drawing resources and talent from smaller towns leading to decline.
SDG Indicator 11.3.1	A global indicator measuring the ratio of land consumption rate to population growth rate, used to assess urban expansion efficiency.
Secondary Centres	Emerging urban nodes outside the main core that support decentralised growth.
Smart Cities	Urban areas that leverage digital technologies, data, and innovation to improve service delivery, infrastructure management, and quality of life.
Spatial Fragmentation	The breaking up of a continuous urban area into smaller, disconnected clusters.
Spatial Inequality	Uneven development between regions, often reflected in intensity or activity differences.
Spatial Pattern	The distribution and arrangement of people, infrastructure, and activities across geographic space.
Spatial Planning	The process of organising land use and infrastructure to achieve efficient, sustainable, and equitable development outcomes.
Spatial Structure	The physical and functional arrangement of land uses, transport systems, and urban form within a city or region.
State Capital Cities (Bandar Negeri)	Administrative centres that serve as key economic and governance hubs within individual states.
String-of-Pearls Pattern	A spatial pattern where multiple nodes are distributed along a corridor or axis.
System of Cities	A network of interconnected cities and towns whose interactions and linkages collectively shape national development.
Systematic Literature Review (SLR)	Structured approach to collecting and synthesising academic research.

Transit-Oriented Development (TOD)	Development concentrated around public transport nodes.
Urbanisation	The process by which a growing share of the population resides in urban areas, typically driven by economic transformation and migration.
Urban Carrying Capacity	The maximum level of human and economic activity a city can sustain without degrading infrastructure or environment.
Urban Equilibrium	A balanced state of land use, transport, and housing systems.
Urban Governance	Policies and decision-making processes shaping urban development.
Urban Morphology	The study of the physical form and structure of urban spaces and how they evolve over time.
Urban Sprawl	Low-density, scattered urban expansion into peripheral areas, often associated with inefficient land use and high infrastructure costs.
Urban System	The network of cities and settlements shaped by economic, social, and infrastructural relationships.
Urban Resilience	The capacity of cities to withstand, adapt to, and recover from shocks and stresses such as climate change, natural disasters, and economic disruptions.
Urbanisation Lifecycle	The progression of cities through stages of development.
Metropolitan Areas (Bandar Global)	Large, internationally connected cities that play a major role in the global economy.
Pixel-Based Classification	A method of analysing images by categorising each pixel according to defined thresholds.
Primary Towns (Bandar Utama)	Important sub-state urban centres with substantial populations and economic functions.
Polycentric Urban Structure	An urban form characterised by multiple centres of activity rather than a single dominant core.
Regional Cities (Bandar Wilayah)	Cities with significant economic and administrative influence extending beyond their state boundaries.
Remote Sensing Proxy	An indirect measure (e.g., light intensity) used to infer real-world phenomena such as economic activity.
VIIRS Day-Night Band (DNB)	A satellite sensor used to capture global nighttime light data for analysing human activity and urban growth.

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Deceleration Stage	A phase where urban concentration peaks and begins to decline due to rising costs and congestion.
Decentralisation	The movement of population and economic activities away from central areas into surrounding regions.

Appendix I: Factors Influencing Urban Agglomeration and Dispersion

FACTORS	KEY MESSAGE	REVIEWED LITERATURE
Theme 1: Economic Structure		
Regional economic strength	• Is the economy in the region doing well? • Measured using GDP, GDP per capita and town performance. • Strong economies create more jobs and better pay. • People and firms prefer to move to these places. • Over time, these locations become the central city cores.	Zhong et al., 2025 ; Pan et al., 2023 ; Gu et al., 2023 ; Gong et al., 2022 ; Huang et al., 2020
Industrial development intensity	• Looks at how busy the industrial and business base is. • Uses industrial output, mix of sectors, investment and electricity use. • Where factories and offices are growing, they attract workers, suppliers and services. • These areas turn into strong industrial and commercial hubs. • Where industry is weak, dense urban centres struggle to grow.	Tian et al., 2025; Gu et al., 2023; Gong et al., 2022; Han et al., 2019; Volgmann & Münter, 2018
Household consumption capacity	• Shows how much residents can spend and how rich the everyday consumption scene is. • Literature measures this through household income and disposable income, retail sales, and indicators of urban vitality such as night-time activity, sports and leisure spending and the presence of “third places” like cafés, malls and social venues. • Where local spending power is strong, businesses prefer to locate, reinforcing commercial agglomeration in city centres and busy neighbourhoods. • Where household consumption is weak, it is challenging to sustain dense clusters of shops and services, and activity tends to remain thin or dispersed.	Zhong et al., 2025; Dejun et al., 2025; Gu et al., 2023; Pan et al., 2023
Service-oriented economic structure	• Describes places where services provide most jobs and income. • Includes finance, business services, education, leisure and tourism • These activities rely on face-to-face contact and city amenities. • They prefer central, well-connected locations. • This creates dense office districts and mixed-use city centres.	Gu et al., 2023 ; Qu et al., 2023 ; Khalid & Effina, 2023; Chen et al., 2021

Economic shrinkage	• Cities and regions whose economies lose previous advantages and fail to upgrade. • This reduces job opportunities and private investment, weakens fiscal capacity and undermines the city's ability to retain residents. • The spatial result is often out-migration. • Underused urban land and a more dispersed, weakened pattern of activity.	Wang et al., 2022
Core city siphon effect	• Reflects how powerful core cities pull people and resources away from smaller towns. • Core cities capture high-value jobs, capital and skilled workers. • Smaller towns lose people and firms. • The core becomes denser and more powerful. • The surrounding area becomes more dispersed and left behind.	Huang et al., 2020; Han et al., 2019
Falling goods transport costs	• Looks at what happens when moving goods becomes cheaper. • Better and cheaper logistics mean factories can spread out. • Firms do not need to sit right next to ports or main hubs. • Production can locate in more places and still stay competitive. • This encourages more dispersed industrial patterns.	Chen et al., 2021
Industrial relocation	• Refers to the deliberate movement of industry and office functions away from primary cores toward secondary cities or outer zones. • Case studies of social landscape change, post-crisis restructuring and knowledge cluster specialisation show how back-office, routine or land-intensive activities are often shifted to locations with lower wages and property costs, • While higher-value control functions remain in prime cores. • This process creates new specialised clusters in second-tier cities and suburban areas, spreading economic activity more widely and gradually reducing the dominance of the main core in certain sectors.	Zhang et al., 2022; Hashimoto & Wójcik, 2021; Volgmann & Münter, 2018; Guevara-Rosero, 2017
Small-town long-term decline	• Describes small towns that slowly lose people and functions. • They face shrinking economies, ageing populations and strong pull from big cities. • Investment is low and services are cut back. • These towns never reach the scale needed for strong local centres. • The wider region ends up with many small, weak and scattered settlements.	Wang et al., 2022; Huang et al., 2020

Theme 2: Population Structure		
Population concentration	• How many people live in an area and how tightly they are clustered. • It covers permanent population, population density, net in- or out-migration, rural population density and the alignment of residents along key corridors or nodes. • Where population is sufficiently large and dense, services and facilities can operate viably and tend to cluster, reinforcing agglomeration. • Dense areas can support schools, clinics, shops and public transport. • Where population remains thin, it is much harder to sustain cores of activity.	Dejun et al., 2025; Zhang et al., 2024; Qu et al., 2023; Yao et al., 2022
Population vitality	• Effects how dynamic the population is in terms of age structure and movement. • It covers the youthfulness of residents, the attraction of new inflows and the role of jobs and infrastructure in pulling a mobile workforce. • Cities with younger, growing populations and many newcomers tend to show higher levels of innovation, entrepreneurship and everyday activity. Encouraging firms and services to concentrate there rather than in places with ageing or stagnant populations	Pan et al., 2023; Wang & Xue, 2019
Household resilience	• How well families can cope with shocks and sustain their livelihoods. • Key elements include savings, the number of working-age members, neighbourhood ties and participation, per-capita income and perceived environmental quality. • Resilient families are more likely to stay, invest and bring others in through family and social networks. • Fragile households are more likely to move out when costs rise or crises hit. • This shapes whether neighbourhoods hold their population or slowly thin out.	Wang J. et al., 2023; Pan et al., 2023
Very low-density shrinkage	• Focuses on areas where population density has dropped too low to recover. • At very low density, population growth often stops or turns negative, creating a “depopulation trap” • There are too few people to sustain shops, schools or basic services. • These places remain sparsely settled and find it hard to rebuild any real urban centre.	Ciommi et al., 2020

High housing costs	• Capture the way expensive housing and living costs push certain groups out of central locations. • High housing and living costs push older adults, young families and low-income households to cheaper areas (Hou et al., 2024; Wang & Xue, 2019). • Central districts can lose residents even if jobs stay there. • Suburbs and edge areas gain population, spreading housing outward.	Hou et al., 2024; Wang L. & Xue, 2019
Redevelopment displacement	• Describes residents being pushed out by redevelopment. • Market-driven projects and changing compensation rules mean some households cannot afford to return • Older central neighbourhoods lose long-term residents. • People move to fringe or outer areas, shifting population from core to edge	Zhang et al., 2022; Han et al., 2019
Population ageing	• Focuses on more older people and fewer births. • Rising old-age dependency and low fertility reduce the active workforce. • Demand for some services falls, and local economies slow. • Younger people often move away, while older residents may choose cheaper or quieter locations. • Cores can stagnate while population spreads across surrounding areas.	Zhang et al., 2022; Wang Q. et al., 2022; Wang L. & Xue, 2019
Weak factor mobility	• Means people, skills and investment do not move easily into smaller cities. • Institutional barriers, lack of incentives or limited opportunities can prevent people and jobs from relocating to secondary cities. • Smaller cities cannot build up enough jobs and talent. • They stay thinly populated, with limited services and weak local centres.	Han et al., 2019
Decentralisation trend	• Describes movement without long-term settling in one big city. • Short-term or circular migration and unstable jobs keep workers circulating between several places. • No single city captures all of the population. • Instead, people are spread across many towns and cities, creating a looser, more dispersed pattern.	Wang & Xue, 2019
Human capital concentration	• Describes where skilled and educated people are clustering. • It is measured through the number of university students, the share of residents with higher education, the presence of universities and high-tech zones. • Knowledge-intensive firms prefer these talent-rich environments. • Skilled workers prefer locations with abundant opportunities, reinforcing strong agglomeration in selected urban nodes.	Zhong et al., 2025; Wang X. et al., 2025; Pan et al., 2023; Zhang et al., 2022; Wang L. & Xue, 2019; Han et al., 2019; Volgmann & Münter, 2018

Theme 3: Governance Context		
Public revenue capacity	• How many people live in an area and how tightly they are clustered. • It covers permanent population, population density, net in- or out-migration, rural population density and the alignment of residents along key corridors or nodes. • Where population is sufficiently large and dense, services and facilities can operate viably and tend to cluster, reinforcing agglomeration. • Dense areas can support schools, clinics, shops and public transport. • Where population remains thin, it is much harder to sustain cores of activity.	Tian et al., 2025; Wang et al., 2025; Gu et al., 2023
Weak land-use control	• Effects how dynamic the population is in terms of age structure and movement. • It covers the youthfulness of residents, the attraction of new inflows and the role of jobs and infrastructure in pulling a mobile workforce. • Cities with younger, growing populations and many newcomers tend to show higher levels of innovation, entrepreneurship and everyday activity. Encouraging firms and services to concentrate there rather than in places with ageing or stagnant populations	Strano et al., 2021
Theme 4: Urban Connectivity		
Transport accessibility corridors	• Capture how easy it is to reach a place via key roads, railways and other major routes. • Studies measure this through road-network density, road mileage, distance to main roads and rail lines, high-speed rail coverage, highway passenger flows and time-based accessibility to jobs and cities. • Places on well-developed corridors are cheaper and faster to reach for people and goods. • Firms, logistics, tourism and housing projects are more likely to choose these locations. • Over time, development tends to “line up” along these routes, forming belts and nodes instead of isolated, scattered growth.	Gu et al., 2023; Wang et al., 2022; Pan et al., 2023; Qu et al., 2023; Ding et al., 2024
Metropolitan proximity	• Describes how close smaller cities and regions are to large metropolitan cores and major markets. • Nearby cities can tap into jobs, higher-order services and wider consumer markets in the main core. • Residents may live in these surrounding cities but commute, trade or seek services in the metropolitan centre. • This proximity effect encourages population and firms to cluster in the metropolitan ring. • Reinforcing a pattern where growth spreads around the core rather than being confined strictly within it.	Khalid & Effina, 2023; Wang & Xue, 2019 ; Zhang et al., 2024; Krzysztofik, 2016

Inter-city linkages	• Focuses on how strongly cities in the same region are connected to each other. • Includes flows of commuters, tourists, freight, business travel and money between cities. • Strong linkages mean cities can "borrow" size and functions from one another instead of acting alone. • Several cities can then share jobs, services and opportunities across the network. • This supports regional agglomerations with multiple linked cores, rather than a single dominant city.	Yuan et al., 2025; Caset et al., 2023; Zuo et al., 2021
Strategic port location	• Describes the advantage of cities placed at key sea or river trade junctions. (Strano et al., 2021; Kassim et al., 2019) • Ports at monsoon turning points, river mouths or busy sea lanes attract traders, warehouses and ship-related services. • Large flows of goods and people are channelled through these nodes, giving them strong economic weight. • As a result, compact and dense urban cores often grow around harbours and riverfronts. • In these cases, waterborne trade acts as a powerful pull factor that anchors urban growth	(Strano et al., 2021; Kassim et al., 2019)
Long commuting times	• Highlights the downside of connectivity when networks are overloaded or the city spreads too far. (Chen et al., 2021; Yuan et al., 2025) • Long daily journeys, especially those over about two hours, reduce the real attractiveness of central locations. • Workers and firms begin to factor in time loss, fatigue and unreliability in their location choices. • Some move closer to emerging sub-centres or to edge areas with easier access. • This gradual shift redistributes people and jobs across a wider area and can support more polycentric or dispersed patterns	(Chen et al., 2021; Yuan et al., 2025)
Overcrowding congestion	• Describes what happens when density and activity exceed the capacity of roads and public spaces. • Cities experience traffic jams, overloaded services, conflicts over limited space and higher environmental stress. • Beyond a certain point, extra density can reduce economic performance and quality of life instead of improving it. • Firms and households may then move to less congested districts or nearby towns. • This movement encourages suburbanisation, decentralisation and the rise of new nodes outside the historic core	Ciommi et al., 2020; Huang et al., 2020; Han et al., 2019; Chen et al., 2021 ; Krzysztofik, 2016

Urban infrastructure quality	• Refers to how strong and reliable basic city systems are: water pipes, buses, street lighting, green spaces, sewage treatment and other services. • Also relates to how intensively urban land is equipped with these services and facilities. • Where infrastructure is robust, cities can host more people and firms in the same area without frequent breakdowns. • These well-serviced zones become natural magnets for residents and businesses and support dense, mixed-use districts. • Areas with weak or patchy infrastructure struggle to attract and keep people and investment, so development remains thin or scattered.	(Gu et al., 2023; Pan et al., 2023) (Wang et al., 2025)
Theme 5: Environmental Setting		
Natural amenity advantages	• Looks at how pleasant the natural setting is for living, tourism and recreation. • Includes green cover, rivers and lakes, scenic mountains, good climate and adequate rainfall. • Attractive landscapes draw homestays, tourism projects and residents who value environmental quality. • Activity tends to cluster along scenic belts, lakefronts and viewpoints. • Nearby areas without these amenities usually remain more lightly settled.	(Hei et al., 2025; Zhang et al., 2024; Shi et al., 2023; Li H. et al., 2022; Zuo et al., 2021; Li J. et al., 2020)
Cultivated land proximity	• Focuses on how close villages and small towns are to arable land. • Short distances to fields reduce travel time and effort for farming and moving goods. • Where high-quality farmland is concentrated in certain plains or valleys, rural settlements cluster there. • Where good land is scattered, settlements are also more spread out. • The pattern of farmland strongly shapes the pattern of rural settlement	(Li H. et al., 2022; Luo et al., 2020)
River proximity	• Shows how rivers and watercourses guide where people live and work. • Villages, cultural sites and economic activities often sit within a preferred distance of rivers. • Rivers provide water, transport routes, fertile land and tourism value. • This creates long settlement lines along rivers and nodes at crossings and confluences. • Areas far from major rivers tend to remain more sparsely populated	(Li H. et al., 2024; Shao & Zoh, 2024; Xu et al., 2022
Rugged terrain constraints	• Captures the limits created by steep, rugged or karst terrain. • Flat, buildable land appears only in small and scattered pockets. • Slopes increase construction costs and make access difficult. • Settlements occupy separate flatter spots instead of merging into one large block. • The result is many small clusters and a more dispersed settlement pattern.	(Yuan et al., 2025; Li H. et al., 2024; Xu et al., 2022; Strano et al., 2021)

High-altitude mountain locations	• Looks at settlements in higher mountain belts and on steeper slopes. • High altitude brings colder climates, steeper terrain and higher access costs. • Most settlements avoid the highest or steepest zones and concentrate in mid-altitude belts and valleys. • Development forms bands along suitable elevation zones rather than one big core. • Truly high-mountain areas remain thinly populated or almost empty.	(Shao & Zoh, 2024; Li H. et al., 2022; Luo et al., 2020; Wang X. et al., 2025)
Limited flat buildable land	• Describes regions where plains are scarce and the landscape is broken by hills, valleys or karst. • There are very few large, continuous flat areas for compact cities. • Towns and villages occupy separate level patches instead of one shared platform. • Urban and rural nodes appear as many small pieces across the landscape. • Dispersion is driven by the physical lack of space for a single dense agglomeration	Yuan et al., 2025; Wang X. et al., 2025
Environmental hazard exposure	• Focuses on areas exposed to frequent or severe natural hazards. • Includes flooding, storms, landslides and harsh climatic conditions. • High risk raises costs and uncertainty for both residents and investors. • Dense urban growth may stall or reverse as people and firms avoid danger zones. • Settlement often fragments into safer pockets or shifts to more secure regions.	Wang Q. et al., 2022; Guevara-Rosero, 2017
Urban heat accumulation	• Reflects heat build-up in dense, heavily built-up areas. • Linked to the urban heat-island effect and high energy use in large agglomerations. • Raises cooling costs and reduces comfort for people living and working in the core. • Some residents and firms prefer cooler peripheral or less dense locations. • This can contribute to outward movement and more dispersed settlement patterns.	Tian et al., 2025; Li J. et al., 2020
Urban pollution pressure	• Represents heavy air and water pollution in dense industrial and urban cores. (Wang X. et al., 2025; Li J. et al., 2020) • Includes high SO_2 emissions, large volumes of sewage and strong ozone or VOC levels. • Successful clustering can create serious pollution hotspots and health concerns. • Regulation and rising living costs push some polluting activities to outer zones. • Residents and firms may relocate to cleaner, less dense areas, changing the spatial pattern.	
Construction sprawl	• Captures the outward spread of construction land into ecological and agricultural areas. (Wang J. et al., 2025) • New development often leapfrogs into the fringe, fragmenting ecosystems and farmland. • Built-up patches appear further from the original core rather than only infilling inside it. • The urban footprint widens into low-density belts around the city. • Overall dispersion increases even though total built-up area grows.	

Construction land intensity	• Measures how much land has been converted to construction and how intensively it is used. • High intensity means large, continuous built-up areas with substantial investment. • These areas offer more services, jobs and infrastructure than their surroundings. • New residents and firms are more likely to choose these established cores. • This reinforces agglomeration and sharpens the contrast between core and periphery	Gu et al., 2023; Gong et al., 2022
Remote landlocked location	• Describes disadvantages of interior regions that are far from coasts and major corridors. • Long distances and difficult terrain raise costs for trade, travel and logistics. • Coastal and well-connected regions gain more from openness and investment. • Remote areas attract fewer firms, migrants and tourists. • They often remain sparsely developed, with smaller and more scattered settlements and weak agglomeration.	Khalid & Effina, 2023; Wang & Xue, 2019; Guevara-Rosero, 2017
Theme 6: Tourism-Cultural Economy		
Tourism market strength	• Captures how large and active the tourism market is in a place. • Uses indicators such as tourism income, number of visitors, travel agencies, tourist density and leisure-venue density • Where these values are high, hotels, homestays, restaurants and attractions prefer to locate. • These businesses cluster in and around scenic areas and city centres. • Over time, these clusters become important local nodes that pull in workers and related enterprises.	Dejun et al., 2025; Zhang et al., 2024; Qu et al., 2023; Zuo et al., 2021
Cultural facility provision	• Describes how many cultural institutions a city has and how much is spent on culture. • Includes the number of public cultural facilities and per-capita spending on education, culture and entertainment • Cities with more museums, theatres, libraries and cultural spaces attract both visitors and residents. • These places become cultural anchors and meeting points in the urban fabric. • Creative industries, cafés and related services then concentrate around these cultural cores	Dejun et al., 2025; Ding et al., 2024
Leisure venue clustering	• Shows how leisure and tourism venues group together in specific locations. • Studies find that homestays, scenic spots and leisure venues tend to locate near major attractions, city centres, main roads and high house-price areas. • These areas attract visitors and higher-income residents who spend on leisure. • Dense road networks and a strong service sector help these clusters grow. • The result is clear tourism belts and entertainment districts as distinct agglomeration zones.	Hei et al., 2025; Qu et al., 2023

Sports resource concentration	• Focuses on where sports-related facilities and markets gather. • Depends on the number of sports facilities, the size of the potential market and general living standards • Cities with strong sports assets become centres for events, training and sports retail. • Sports tourism also concentrates around these hubs. • Together this creates specialised clusters built around stadiums, arenas and related services	Zhong et al., 2025; Zuo et al., 2021
Night-time economic activity	• Captures how lively the city is after dark. • Uses indicators of night cultural tourism, night markets, late-hour transport, lighting and overall night-economy development. • Areas with strong night-life host dense clusters of restaurants, bars, entertainment venues and evening events. • These districts stay active well beyond normal working hours. • Over time, they become recognised night-time cores that reinforce local agglomeration on top of daytime activity	Dejun et al., 2025; Wang X. et al., 2025; Xiong et al., 2024; Pan et al., 2023
Theme 7: Geopolitical Heritage		
Cultural heritage concentration	• Focuses on places with many recognised heritage sites and traditional settlements. • Includes major cultural–religious landmarks that attract pilgrims, tourists and traders. • These locations become symbolic focal points for culture, commerce and daily life. • Over time, they develop dense urban cores with strong and distinctive identities. • Example: Melaka's historical role as a maritime and cultural hub still anchors activity today.	Shao & Zoh, 2024; Shi et al., 2023; Kassim et al., 2019
Royal political centrality	• Refers to cities that act as royal or political capitals for a wider region. • Concentrates authority, legitimacy and administration in a single place. • Draws people, goods, learning and culture toward that political core. • Reinforces the city's status as a major agglomeration hub in the regional system. • Melaka's royal institution and alliances illustrate this centralising effect.	Kassim et al., 2019
Conflict risk	• Captures how the threat of violence or political instability affects where people and firms choose to locate. • When the perceived risk of conflict is high, large and visible cities can be seen as potential focal points for tension or targets, so households and businesses may avoid concentrating in a single main core. • Instead, activity shifts toward smaller, safer or less prominent cities and towns. • This weakens urban primacy and contributes to a more scattered pattern of settlement across several centres rather than one dominant agglomeration.	Eberle et al., 2020

Geopolitical fragmentation	• Describes how conquests and colonial treaties can split a once-unified core region. • Political power shifts, royal courts relocate and elites move to new centres. • Architectural and cultural forms from the original core spread to other ports and islands. • The result is a network of successor cities sharing the old centre's influence. • This turns a concentrated system into a more dispersed regional structure.	Kassim et al., 2019
Theme 8: Spatial Structure		
Agglomeration economies	• Describe the extra advantages that firms and workers gain when they locate close to each other. • These advantages include a shared pool of labour, shared suppliers and infrastructure, lower commuting and freight costs, faster knowledge spillovers, and consumer preference for having many choices in one place. • Encourage firms and households to concentrate in specific areas rather than spread evenly across space. • Measured through indicators such as manufacturing agglomeration, productivity contributions or gravity-type attraction. • Agglomeration economies help explain why some locations grow into large, dense clusters while others remain small or thinly developed.	Wu et al., 2025; Caset et al., 2023; Strano et al., 2021; Krzysztofik, 2016
Polycentric city structure	• Refers to regions with several important centres rather than one dominant city. • In such systems, traditional multi-centre settlement patterns, major river–lake axes and inherited historic cores often guide where new clusters emerge. • New knowledge-based or high-tech districts, for example, tend to develop in ways that reflect this existing multi-nodal layout. • Empirical work on European and Chinese regions shows that polycentric structures can share growth, functions and accessibility across multiple cores, rather than funnelling all activity into a single primate city. • Spatially, this produces a network of linked centres that collectively form the urban system, rather than one "king city" surrounded by dependent peripheries.	Zhang L. et al., 2022; Volgmann & Münter, 2018; Caset et al., 2023
Neighbourhood attraction parameter	• Comes from spatial growth models of how cities expand cell by cell. • Measures how strongly new development tends to locate next to existing built-up areas. • High attraction → compact, contiguous growth that thickens current cores. • Low attraction or strong outward pressures → leapfrog and scattered development. • Shows how simple local rules can produce either tight agglomerations or very dispersed forms over time.	Strano et al., 2021