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Urban Morphological Analysis Framework for Sustainable Malay Town Transition in Response to COVID 19

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ABSTRACT

Current approaches applied in the historical analysis on the morphological evolution of early Malay towns primarily focused on describing *how* cities were formed and transformed without much emphasis on how they can be analysed. Considering cities as urban organisms experiencing rapid growth, achieving a sustainable urban transition would be impossible without understanding the process of initial formation and spatial uniqueness that comprise the Malay town. However, analysing the particular kind of processes requires a comprehensive understanding of each hierarchical level of morphological elements, which, therefore, posed a greater challenge in excerpting Malay town's dynamic and organic growth pattern-development. This study attempt to develop the methodological process of urban morphological analysis framework concerning the Malay town context. With the adoption of the historic-geographical approach as the method of analysis, the study applied two different spatial scales as the basis of the analysis process, that is, plan-units analysis and morphological evolution analysis. The findings unveiled the inherent morphogenesis processes of Malay towns central to the spatial structure of *Kota,* represent a town that functioned as a territorial base with settlements of *Kampung* as the archetype of the morphological unit. Through depicting the spatial boundary of *Dalam Kota* and *Luar Kota,* the fixation line of the growth process in Malay town can be identified, which is imperative to the functioning system of the town. Accordingly, developing the systematic morphological analysis process aids in providing a clear and responsive strategy for managing the changing process of Malay towns to ensure a sustainable transition for resilient communities and territories.

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1. Introduction

The theories and practices of urban morphology as a scientific study of urban form have fascinated numerous multidisciplinary field scholars, henceforth creating a vast mosaic of knowledge tradition and diversity of approaches being applied in the same context to analyse urban form. In scrutinising the explicit definition and scope of urban morphology as a specific field of knowledge, Kropf (2009) highlighted the critical evaluation commonly associated with the multitude of assumptions related to the terms itself, that is not at a broader semantic level but in terms of the operative definitions manifest in the works within the field. In morphological research discourse, morphology is linked to the coined Greek words morphe (form) and logy (science). The core of the term 'morphology' as initially conceived by Johann Wolfgang von Goethe (1749-1832) means 'a science dealing with the very essence of forms' (Bullock et al., 1988 as cited in Marshall & Caliskan, 2011).

As a research pattern commonly known in the biological branch, the more general sense of 'morphology' has been applied to numerous scientific disciplines, including linguistics, philosophy, sociology, culturology, and physical geography. Notably, the distinctive characteristic of all morphological research, regardless of the various fields being applied, indeed aimed to explain the phenomena and processes connected to the origin of specific structures and forms observed concurrently and identify the common morphological characteristics shared by the particular elements (Oliveria, 2018). The adoption of morphology in the context of built environmental field as been conceptualised by Steadman (2008) from the biological analogy of morphological research, referring to the study of the structural relationships between different parts or aspects of the object to ascertain the relative of location resulted from the process of formation and transformation which shaped the overall form (Kropf, 2013). Taking into account the structural relationship between parts of an object in urban form, several scholars have highlighted the necessity to set the boundary of assessment to exclusively examined the physical elements, rather than the myriad relationship of urban form elements have towards other attributes, qualities or components (Scheer 2017; Oliveria, 2016; 2016; Kropf, 2009, 2017).

While it is undeniable the correlations of urban form with other attributes such as economic and social determinants, the limitation in defining the functional scope of urban morphology, therefore, allows the study to serve as a platform and play a vital role in a decision-making need within a city-wide context of physical planning and urban design. This urgency becomes crucial in facing the dramatic health crisis of the COVID-19 pandemic that will reshape the traditional urban form of cities and towns. Therefore, this study attempts to understand how the elements of urban form in traditional Malay towns were configured in a hierarchical system of urban morphological analysis to comprehend its evolutionary process. It thus leads to providing a critical reflection on the spatial response in adapting to COVID-19.

2. Methodology

2.1 Description of Study Area

This study is conducted in Kota Bharu, the capital city of Kelantan, located in the eastern part of Peninsula Malaysia (latitude 6°8'0.9 N, longitude 102°14'18.0 E) to represent the evolutionary process of early Malay town. Built formally since 1845 with the construction of the royal palace of Istana Balai Besar, Kota Bharu has been recognized as one of the nine prominent Royal Towns in Malaysia alongside with Alor Star (Kedah), Arau (Perlis), Johore Bahru (Johor), Klang (Selangor), Kuala Kangsar (Perak), Kuala Terengganu (Terengganu), Pekan (Pahang) and Sri Menanti (Negeri Sembilan) (Khor et al., 2017). These towns were formed and developed from merging several Malay settlements of villages or Kampung through the process of synoecism as referred by Kostof (1991) and eventually became state capital that grew around the palaces or Istana of the Malay Rulers.

The town's strategic location near the mouth of Kelantan River influenced the natural growth of the town as a port and trading centre, which drew the traders and settlers and thus encouraged the transformation of the surrounding settlements as a focal point for urban development. Mosque, administrative and institutional buildings, market (Pasar), and open space (Padang) were invariably built in close proximity to the palace. These components have shaped the distinctive spatial structure and patterns of its physical urban form with Malay town's unique urban fabric and character.

Kota Bharu is divided into 15 Planning Blocks (Blok Perancangan, BP). The study area is concentrated in Planning Block 1 (BP1), namely the central part of Kota Bharu. Based on the administrative and operational area, BP1 Kota Bharu consists of 28 Small Planning Blocks (Blok Perancangan Kecil, BPK), also previously known as Section. Among these 28 BPK, the focused study area is on the Old Town Center of Kota Bharu, locally known as Bandar Lama Kota Bharu. Bandar Lama Kota Bharu, amongst others, encompasses four BPK that became the specific focus of the study area, namely BPK1.5, BPK1.6, BPK1.7 and BPK1.19. These areas comprise a total land size of 65.90 hectares with a mix uses of commercial, residential, and administration land uses.

The delineation of the study area according to BPK guides the mapping analysis by comparing the evolutionary process of its spatial structure and patterns according to the categorisation of the morphological elements. These four BPK mentioned above were selected based on their significant land use type variability in the urban area. Table 1 summarised the selection basis of the BPK area following SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats). While Figure 1 depicts the boundary of the study area in Bandar Lama Kota Bharu, Kelantan

Key Plan: Peninsula Malaysia

Location Plan: BP1 Kota Bharu

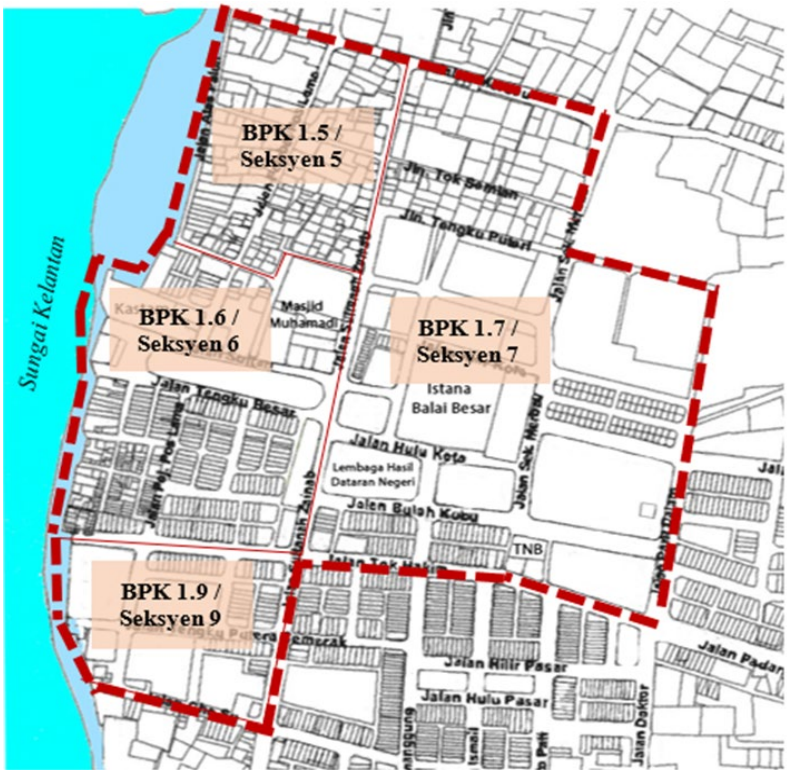

Figure 1 Study Area in Bandar Lama Kota Bharu, Kelantan

Table 1 Determinants of Case Study Area

SWOT	Key Determinants	Evaluation Criteria
Strength (S)	Physical factors of the study area	• The earliest urban area in Kelantan developed since the opening of the capital city of Kota Bharu in 1845 and has a long period of urban development to be studied. • Undergone various stages of the process of formation and transformation of urban form and exhibiting significant morphogenetic characteristics.
Weakness (W)	Exiting conditions of the study area	• Dysfunctional area at old commercial area alongside Sungai Kelantan. • Rapid changes of development partially destroyed urban fabric with the development of mega-scale development projects.t • The adoption of modernism has caused a dispersal and disconnection from the urban form character of Malay town.
Opportunity (O)	Urban pattern analysis criteria	• Comprise a variety of land uses to depict the urban complexities of traditional Malay towns. • The presence components of Malay town partially settled in places such as Istana Balai Besar, Masjid Muhammadi and Padang Merdeka, which are still kept intact at the core area of the town, enables the acquisition of gathering formal data in accordance with the diachronic comparison process. • A reasonable size area, which is between 50 to 150 hectares, allows the execution of pattern analysis.
Threat (T)	Current development process	• Insensitive development in areas with high historical values without considering the relationship of traditional urban form pattern and functions. • Unresponsive development that emphasises purely aesthetic function. • The development practice employing the notion of new urbanist project merely targeting for developer's marketing campaign rather than appraisal towards the natural evolutionary character of Malay town

2.2 Data Collection

2.2.1 Acquiring Formal Urban Data

Kropf (2009) distinguished the interdisciplinary research on urban morphology from other urban analyses related to acquiring formal data in a particular place of study. As employed by Scheer (2017), formal data referred to data obtained to represent the semipermanent and definitively located physical elements of a particular place. In the process of acquiring formal urban data, several aspects of formality should be considered, including scales, the particularity of date or years and identifiable geographically in terms of areas (Scheer, 2017; 2016). Data obtained, therefore, is objective and measurable, which helps to improve the validity and reliability of the study.

By employing document analysis as data collection strategies, the collected data in this study consist of primarily archival data. It can be categorised into five types of text documents, including historical written text, historical maps, early travel records, photographs, and official records. These data types are qualitative, flexible and context-specific to be adopted in the interpretation process of the geographical evolution of the town through an interpretative-historical design framework. Table 2 depicts the sample of primary uses from secondary data in the study.

Table 2 Sample Selection for Document Analysis

Types of Documents	Document Title	Note
Written historical source (Books, Journals, Monograph)	1. Detik2 Sejarah Kelantan (1971) 2. Kelantan dari Zaman ke Zaman (1970) 3. Monograf Warisan Kelantan 4. Journal of the Malayan Branch of the Royal Asiatic Society (JMBRAS)	Books on the historical, economic, political and sociological background of Kelantan
Early travel records	1. Kisah Pelayaran Abdullah Munshi (1838) / Kisah pelayaran Abdullah ke Kelantan 2. Kelantan: A Handbook of the Malay Peninsula (1907) 3. What I Saw in Malaya (1936, 2020). 4. Kelantan Religion Society and Politics in Malay State (1974) 5. The Civil War in Kelantan in 1839 (1965) 6. The peoples and Politics of the Far East (1894)	Observation and experience in Malaya during the early 19th century were documented through a travelogue and publishing books
Historical Maps	1. Schematic Map of Bandar Kota Bharu in early 1910 2. Aerial view of Bandar Kota Bharu in 1960's	Archival research on historical maps
Early photographs	1. Photos of Kota Bharu around 1909 2. Photos of Kota Bharu around 1950 3. Photos of Kota Bharu around1970	Archival research on early photographs

2.3 Data Analysis

2.3.1 Mapping Analysis Process Framework

In developing the Mapping Analysis Process Framework, two technical syntaxes within urban morphological analysis process are explained as follows:

(i) Phase 1: Determining Diachronic-Synchronic Comparison of Morphological Phase

Specific research-based methodologies for urban analysis generally provide various spatial representation techniques that principally rely on the three main elements: measurement, analysis, and comparison of actual places. Therefore, the longitudinal types of research in urban morphological analysis involve interpretation of the evolutionary process of the spatial structure and patterns of the town throughout the observation period. Such an observation process requires a comparative evaluation which is indeed central in data analysis stages. Methods of comparison are commonly adopted to observe the changing process central around the diachronic and synchronic as encapsulated by Scheer (2017). Diachronic comparisons refer to time comparisons, that is, comparing different periods at the same study area. In contrast, synchronic comparisons refer to area comparison, in which evaluations of different study areas over the same period (Caniggia & Maffei, 2001; Scheer 2017). Data obtained were analysed comparatively with different area comparisons or time comparisons to understand how the changing process evolved and influenced the spatial structure and patterns at Bandar Lama Kota Bharu.

The study employed an embedded design exploration of a case study, in which the comparison of data is made sequentially and moves interchangeably between diachronic and synchronic. The diachronic comparison analysed the growth development of Bandar Lama Kota Bharu concerning the formation and transformation of the town from 1816 to 1909. These changing phases are referred to as morphological phases. Simultaneously, the synchronic comparison closely examined the changing spatial structure and pattern in each of the four selected BPK. Accordingly, these BPK were further segmented and categorised based on their land-use function and referred to as a morphological zone.

(ii) Phase 2: Categorising the Hierarchical Scale of Morphological Elements

Prior studies have highlighted the importance of providing a clear classification framework of morphological elements which involves some processes of selection and simplification to reflect a shared understanding on the hierarchical scale of urban form analysis (Osmond, 2010; Kropf & Malfroy 2013; Ravari & Mazloomi, 2015; Crowther, 2016). In the context of historical urban analysis of Malay town, such systematic classification framework is absent due to insufficient understanding of how these morphological elements juxtaposed, overlapping and fit each other as embed within the underlying theoretical underpinning of 'city as a mosaic of urban form' (Whitehand, 2001, 2013). Besides, Oliveria (2011) also highlighted the importance of a clear depiction of the analysis framework to explain, synthesise and

therefore captured how the morphogenetic processes occurred, which then influenced the functioning system of the town.

Thus, conceptualising from Kropf Taxonomy stemming from the adoption of historico-geographical approach as a method of analysis, two different spatial scales used as the basis of the analysis process, that is, plan-units analysis and morphological evolution analysis. The plan-unit analysis analyses the physical and spatial components of the four morphological core elements at the scale of plot, streets, building, and open space (Moudon, 1994; Levy, 1999). While in the morphological evolution analysis, the examination was conducted at the higher scale level, which is on the taxonomy of urban tissue. Figure 2 describes the mapping analysis framework adopted in this research.

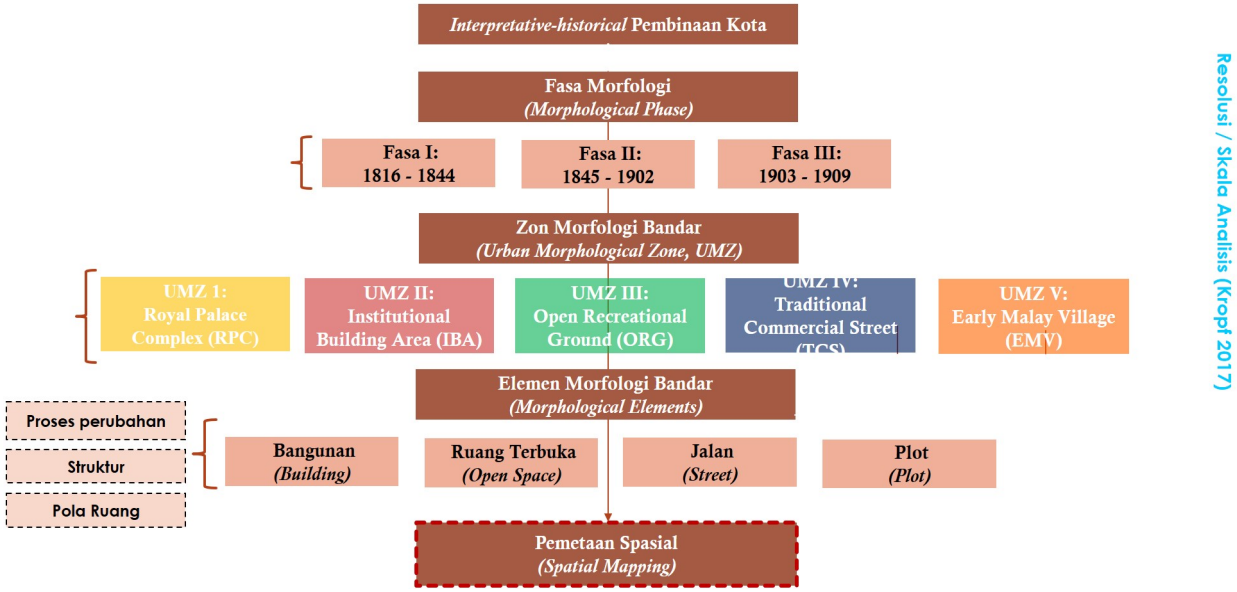

Figure 2 Mapping Analysis Framework

3. *Findings and Discussion*

The discussion of the significant findings in this study are discussed in three interrelated parts as follow:

3.1 Interpretative Historical of Evolutionary Process on the Formation and Transformation of Kota in Bandar Lama Kota Bharu, Kelantan

Within the historical interpretative lens, concerning the morphological process of Malay towns, the discussion can be geared towards examining the historical formation of the Kota. In Malay historiographical tradition, Kota is synonymously used to represent a city, town or urban area. Other than that, Kota closely functioned as the administrative centre of the Malay rulers focused on the royal palace of Istana besides equated also as a fort (Siti Norlizaiha & Rusamah, 2014; 2012). Therefore, analysing the spatial structure and pattern changes in early Malays towns can be identified by tracing the evolutionary process of Kota formation diachronically within a paradigmatic city-building model. In the case of Malay town, it refers to the fort construction that signifies the establishment of a government or Kerajaan amongst the Malay Sultan. Table 3 summarises the evolutionary process on the formation and transformation of Bandar Lama Kota Bharu, Kelantan.

3.2 Spatial Pattern of Urban Form in Malay Town according to the Structure of Dalam Kota and Luar Kota

The construction of Kota in the early 19th century demonstrates the similar main components in Malay town's urban areas, which comprise of palaces or Istana, mosques, jetty or Pengkalan, open ground fields known as Padang and court or Mahkamah.

These significant components reflected the organisational system of spatial formation and planning of the urban area in Malay town. For example, an early recorded on the structure of Kota in the broader context of state or 'Kerajaan Kelantan', the earliest records by Hsieh Ching-Kao around the 1780s described the spatial pattern of Kota Galuh (1777-1815), which generally divided into two structures, namely: (i) Dalam Kota; and (ii) Luar Kota (Tweedie, 1923). The demarcation of Dalam Kota was surrounded by fortification in the form of a palisade as fences enclosed by bamboo trees and deep trenches as an element of defence against the palace grounds and residence of Malay ruler - Sultan. This spatial structure was preserved after the subsequent transition of the state capital to Kota Kebun Mengseta on Saba Island (1816-1844) and finally to Istana Balai Besar in Kota Bharu (1845). Figure 3 illustrates the spatial structure of Dalam Kota and Luar Kota in Malay towns.

Table 3 The evolutionary process on the formation and transformation of Kota in reference to Bandar Lama Kota Bharu, Kelantan

Kota	Location and Village Agglomeration	Urban Pattern and Components
Kota Kebun Mengseta (1816) Sultan Muhammad I (1800-1835)	Pulau Saba (area between Jabatan Kastam DiRaja and part of Padang Merdeka *Synoecism:* 1. Kampung Kota Sultan (areas at Jabatan Kastam DiRaja) 2. Kampung Raja Bendahara (part of Kampung Sungai Budur)	**(i) Dalam Kota:** 1. Istana Kebun Mengseta 2. Masjid (deduction of Masjid Kayu/Masjid Tua/Masjid Kota Bharu that presently an area of Masjid Muhammadi) 3. Aristocrat house/palace 4. Administrative buildings 5. Port or Pengkalan (noted by Abdullah Munshi as Pengkalan Tambang) 5. Padang – Kebun Mengseta 6. Siamese High Commissioner house 7. Pasar (Gok Kapur) 8. Tax house
Kota Bharu (1845) *dibuka oleh Sultan Muhammad II (1838-1886)	Old Town Kota Bharu. *Synoecism:* 1. Kampung Kota Sultan (area in Jabatan Kastam DiRaja) 2. Kampung Raja Bendahara (part of Kampung Sungai Budur) 3. Kampung Masjid (areas at Masjid Muhammadi)	**(ii) Luar Kota:** 1. Village settlements **(i) Dalam Kota:** 1. Istana Balai Besar 2. Masjid Muhammadi 3. Aristocrat house/palace 4. Administrative buildings 5. Port or Pengkalan 5. Padang – Padang Kalumpang 6. Siamese High Commissioner house 7. Pasar (Areas at Taman Sekebun Bunga) 8. Tax house **(ii) Luar Kota:** 1. Village settlements

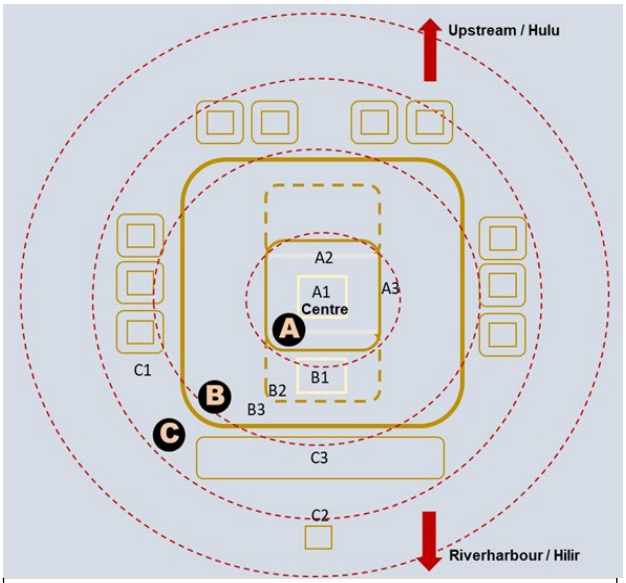

Figure 3 Spatial Structure and Pattern of Kota (Adapted and revised from Tajudeen, 2005)

3.3 Fixation Line of Kota Delineating the Changing Process and Adapting to Urban Transition

The basic morphological principle presented engage with the concept of coextensive forms, which reflects the integration of Typological Process and Historical-geographical approaches of spatial (or co-presence) and temporal (or derivation), implying the understanding of the formation and transformation of the spatial structure and pattern of urban form throughout multiple scales of analysis are indeed interrelated and juxtaposed to each other. Another level of scale within the scheme mentioned above is the identification of the fixation line. Stemming from Conzenian terminology, Nikovic et al. (2014) encapsulated the fixation line in the traditional city as an outer site of a linear feature, which is the line of fortification or demarcation line of Kota. This line indicates the expansion growth of Kota in terms of spatial structure and patterns that are traceable over time, regardless of the inexistence of the physical substance.

Arguably, understanding and evaluating the changing of the fixation line based on three principles as outlined by Unlu (2019) that are historical interpretative of urban forms, the hierarchical nesting of morphological elements and the relationship of the urban form elements within a complex interaction, therefore, aid in developing a comprehensive understanding on how Malay town has been evolved historically. As cities need to adapt and respond to the COVID-19, the discussion on the fixation line of Kota can be regarded as fruitful discussion from a morphological perspective to be utilised in

planning practice by considering the morphological unity of urban form elements and components in Malay town. Figure 4 depicts the fixation line of Bandar Lama Kota Bharu, revealing the evolution of the changing process of the town's urban growth.

Figure 4 The Changing of Boundary Matrix in Old Town of Kota Bharu, Kelantan from 1816-1909

4. Conclusion

This study set out to develop an understanding of how the elements of urban form in early Malay towns were configured in a hierarchical system of urban morphological analysis by analysing its evolutionary process. It has established a methodological framework for the mapping analysis process in reference to the Malay town context with a single case study at Bandar Lama Kota Bharu, Kelantan. The establishment of the systematic methodological framework will serve as a guideline for a deeper exploration of the relationship between the morphological elements of urban form specific to Malay settlements to understand better how the Malay settlement was formed, grew, and developed. The study also has highlighted the existence structure of Kota as an intrinsic quality of urban form in early Malay town. Apart from that, the understanding process of the town formation through the merging of several kampungs can be regarded as a basic morphological archetype for the spatial pattern of the town. Besides, the delineation boundary of Kota consisting of Dalam Kota and Luar Kota reveals a vital need to comprehend such boundary demarcation, which eventually determined the fixation line of the town.

An utmost emphasis should be geared towards recognising the flexibility of Malay urban forms central to the spatial structure of Kota. The spatial structure and arrangement of land use in plan unit analysis and urban patterns all play essential roles in defining the optimal method for urban regeneration and, as a result, the long-term viability of cities (Yang et al., 2019). Thus, understanding the urban patterns and morphological changes during the urbanisation process has implications for urban planning and sustainability. Despite well-documented examples of Asian urban sustainability practices, the internal mechanisms of the practices, their transferability, and their impact on urban sustainability transitions remain unexplored (Bai et al., 2010). As a result, this study contends that innovative urban practices as perceived from a system innovation and urban environmental evolution perspective can only be realised with a clear understanding of their town's evolution through systematic urban morphological analysis. In line with the aim of this paper, the establishment of a clear methodological framework for urban morphological analysis in reference to the early Malay town thus can be geared towards as an opportunity to sustainably transform the cities in building resilience for adapting the global catastrophe such as pandemic COVID-19 health crisis.

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