Kuala Lumpur (KL), the capital and premier city in Malaysia has a total land area of 243.7 km² (AJM 2006), located within the suburbs of Klang Valley with a total population of 1,556,200 in 2005. Thus, its density reached 6386 persons per km². Planning wise, Kuala Lumpur is divided into six strategic zones (AJM 2006) under the Kuala Lumpur Structure Plan (2004–2020). The mega city is connected with the surrounding areas by highways such as KESAS, Federal Highway, NPE, ELITE, roads, and railways (Light Rail Transits and KTM Komuter).
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Chapter 1
Kuala Lumpur City Centre Integrated Urban Development Zone: A New Art of Urban Living

1 Introduction

Kuala Lumpur (KL), the capital and premier city in Malaysia has a total land area of 243.7 km² (AJM 2006), located within the suburbs of Klang Valley with a total population of 1,556,200 in 2005. Thus, its density reached 6386 persons per km². Planning wise, Kuala Lumpur is divided into six strategic zones (AJM 2006) under the Kuala Lumpur Structure Plan (2004–2020). The mega city is connected with the surrounding areas by highways such as KESAS, Federal Highway, NPE, ELITE, roads, and railways (Light Rail Transits and KTM Komuter).

Kuala Lumpur City Centre (KLCC) Zone situated within the city centre of Kuala Lumpur is shown in Fig. 1.1. The zone is covering 1, 813 ha and surrounded by major movement network crossing east–west axis as well as north–south axis; several hills such as Bukit Nanas, Bukit Ceylon, Bukit Tunku and the river valleys of Sungai Klang and Sungai Gombak as shown in Fig. 1.2 (Kuala Lumpur City Hall 2008).

KLCC zone is lively and attractive and like any other fast growing city, its population is expected to rise up to 245,600 people in 2020 from 128,721 in 2000. The employment of the City Centre in 2000 was 396,036 and is projected to be about 438,010 by 2020.

The relocation of federal government offices to Putrajaya has further changed the traditional role of the city centre as residential cum commercial in Kuala Lumpur setting into a commercial centre of attraction that could draw people back to the inner city. Apart from the social aspect, the inner city development is to follow the general principle of urban design guide line in terms of controlling the building heights, maintaining the city wide view and defining the visual corridors, this main
commercial district now has the characteristic that creates an attractive and unique identity of a city to showcase Kuala Lumpur as A World Class City.

In aiming to reduce the Carbon footprint and traffic congestion, City Hall of KL is promoting the use of public transportation, facilitating pedestrian movement and organising the bicycle network around KLCC Zone. In order to improve the overall environmental quality of Kuala Lumpur City Centre zone, the green area is extended into the city centre. The existing community facilities in the city centre have been upgraded and additional community facilities shall be provided for the city residents within a comprehensive mixed-use development.

Fig. 1.1 Development strategy city centre (Kuala Lumpur Structure Plan 2020)
Urban Living in Malaysia

The Kuala Lumpur region had a population of approximately 7.1 million, according to the 2010 census. This includes 1.6 million in the federal territory (core city) of Kuala Lumpur and 5.5 million in the suburbs (which include Putrajaya). The region has experienced strong growth since modern Malaysia evolved between 1957 and 1963. In 1950, the region had only 900,000 residents. By 1980, the population had more than doubled to nearly 2.4 million and by 2010; the population had tripled from its 1980 level.

Kuala Lumpur continues experiencing strong population growth. Since 1980 (the first census after the creation of the new territory), the city has experienced a
population increase of 77%. Yet, the suburbs and exurbs have grown far more rapidly. The suburbs and exurbs have grown 280% and have added nearly 6 times the population increase of the city. This general distribution of growth continued over the past decade, with the suburbs attracting 83% of the new population, while the city centre of Kuala Lumpur received 17% of the growth. Indeed measures to facilitate the increase of the population in the inner city are seen crucial.

2.1 The Old Traditional and New Kuala Lumpur

Gurstein (1984) states that Malaysia has not had a long history of urban settlements, being a predominantly rural and village (kampong)-based society. The large urban settlements such as Kuala Lumpur were established as a ‘traditional city’ and a centre of tin-mining activity. Morphological studies on the growth of the town centres in Malaysia indicated that the early component of Kuala Lumpur includes the old shop houses, market, and places of worship with walkable streets. The shop house was a mixed-use vertical arrangement having a working space on the ground floor and the living spaces on the upper floors. The typical two-storey shop house, with the ground floor for trading and the first floor for residential use is still a standard feature in the centres of Malaysian towns and cities (Yeang 1992; Ismail and Shamsuddin 2005). These buildings’ typology is important as they are the oldest extant urban dwellings in the country (Ismail and Shamsuddin 2005).

With the advent of globalisation and spread of the international style, Kuala Lumpur lost its essence of a traditional walking city. Economic growth became the agenda accompanied by the development of large commercial zones in the inner city. The increasing property price in Kuala Lumpur led city dwellers to search for affordable accommodation outside the city. This brought with it a myriad of issues including: separated land uses (zoning), severe traffic congestion due to the increased dependence on private vehicles and the urban heat island effect. Figure 1.3 below shows the Kuala Lumpur city growth throughout several eras from a small traditional and walkable town to highly congested city due to the urban sprawl to the suburbs (Mastura 2013).

However, over the last 10 years, many established developers in Malaysia have initiated alternative approaches to their development concepts in order to improve the quality of life for clients and their commercial objectives of improved market-ability (Alias et al. 2011). In his research interviews with some of the major developers in Malaysia, Hamid (2002) underlined that real estate products are not only just the physical appearances of buildings, but includes a fine grain amalgamation of the environment, adjacent neighbourhoods, infrastructure, and the amenities such as seamless transportation, that make up the total development within the city (Alias et al. 2011). Accessibility is the ease at which amenities can be accessed without the need to travel excessively (Harvey 2000). These are the features emphasised in many urban developments in Malaysia (Alias et al. 2011). Several measures have been formulated to improve the market positioning by the developers during recent
years among which include the promotion of environmentally oriented and ecological-friendly development schemes, the provision of parks and recreation space, and support for green movements (Alias et al. 2011). These development schemes are seem to meet customer desires for a green and connected communal living lifestyle. The above mentioned components of the current real estate development in some way has adopted the concept of New Urbanism that has been emerged in the United States in the early 1980s as a reaction to growing urban sprawl (Alias et al. 2011; Fulton 1996). It advocates design-based approaches using...
traditional urban forms to help mitigate suburban sprawl and inner city decline in rebuilding developments for cities (Bohl 2000; Alias et al. 2011).

In a study by Alias et al. (2011) of the level of awareness of New Urbanism in Malaysia, the respondents from the development companies were not aware or well-informed of ‘New Urbanism’ in the first instance, however, they reckoned that the concept was not alien to the local context. They observed that the idea of emphasizing the design concept such as addressing certain aspects of sustainability and ecological issues by providing large reserves of green area, water features, self-sufficient or compact inner-city neighbourhoods with complete facilities and amenities within have been very much advertised by the reputable developers in the country, hence, is not a new phenomenon (Alias et al. 2011). Furthermore, this new approach is to mitigate the negative impact from the development during 1980 till 2000 to the urban community in KL as described in Fig. 1.3.

2.2 Kuala Lumpur as ‘A World Class City’

In the 1990s, global financial capitals began spreading across the Asia-Pacific region. Major cities including Kuala Lumpur began to experience fundamental restructuring of their built environments to reconstitute the urban core for global management and service functions in the form of mega projects aimed at intentionally creating world class cities (Douglas et al. 2008). According to Douglas et al. (2008), as cities are the principle bases for foreign direct investment, both national and local authorities have been fully engaged in the business of attracting transnational capital to the city. It is hoped that these investments will build up the urban economy and bring about an increase in demand for the city’s workforce, and in turn create an enlarged market for local businesses. Kuala Lumpur has welcomed these developments in the global economy, on the assumption that they will open local economies and intensify global investment (Bunnell et al. 2002).

Bunnell et al. (2002) state that the ‘world class’ urban investment in Kuala Lumpur city was increasingly understood as part of a national agenda to ‘plug in’ to global political, economic and social networks. Douglas et al. (2008) suggested that the increased involvement of different capital circuits implies the pull of cities towards world city formation and this is reflected in the built environment via new commercial spaces of production (such as business districts, techno parks and science parks) and consumption (such as shopping malls).

As the globalising process went on, in 1991, Dr. Mahathir Mohamad, the Malaysian Prime Minister at the time, launched a ‘Vision 2020’ or ‘Wawasan 2020’, a national vision aimed at transforming Malaysia into a fully developed nation by the year 2020 (CHKL 2004). The vision, articulated in the document ‘Kuala Lumpur—A World Class City’, encapsulated the ambition to make a city that would assume a major global role, for the benefit of all its inhabitants, workers, visitors and investors. According to Vision 2020, Kuala Lumpur will strive to establish the highest
standard of quality living, working and business environments, benchmarked against the best in the world (KLCH 2004). This was seen as necessary as it was believed that the developed city will be able to attract and retain national and international investors as well as skilled and professional workers, both local and foreign (KLCH 2004). In addition to the ambition to create a world class city, the government believed that it is important to ensure that the infrastructure, environment, city management, and cultural, social, and community facilities meet the highest expectations of the majority of its residents, workers, visitors and investors (KLCH 2004; Douglas et al. 2008). Five goals were identified in order to achieve the Kuala Lumpur Structure Plan 2020, as listed in Table 1.1 below.

In order to synchronise with the city’s global aspirations of becoming ‘A World Class City’, two mega projects were undertaken at the beginning of the 1990s: the Kuala Lumpur City Centre (KLCC) and the Kuala Lumpur International Airport (KLIA). The two were subsequently followed by other equally important developments such as Putrajaya as a Federal Government Administrative Centre. They are discussed in the following section.
2.3 Living in KLCC International Zone: ‘City-Within-a-City’

The largest project undertaken to create a world class city was the Kuala Lumpur City Centre (KLCC) International Zone, built in 1992 on the site of the former colonial race course off Jalan Ampang. The project was located in the north-eastward expansion of the Golden Triangle Area (GTA) commercial district (Fig. 1.4). This mega project conceptualised a ‘City-within-a-City’ (KLCC Holdings Sdn. Bhd., circa. 1996a), which was proclaimed by the former Prime Minister Mahathir Mohamad as ‘among

Fig. 1.4 The mega project of Kuala Lumpur City Centre (KLCC) in the marked boundary of the Golden Triangle Area (KLCC Marketing brochure 1996b)
the largest real estate in the world’ (Mahathir 1992). As cited in Bunnel (1999),
the KLCC project may be understood in terms of regional economic change and was
one among a myriad of ‘Urban Mega projects’ (Olds 1995) and considered to be
economically ‘miraculous’ in the Asia-Pacific region (World Bank 1993).

The development of this ‘City-within-a-City’ included the Petronas Twin Towers
which was the tallest building in the world up to the end of the second millennium.
Its construction was part of the greatest boom in sky-scraper construction in history,
led largely by rapidly urbanising societies in Asia (Scientific American 2011).

The Petronas Towers formed part of a larger development project and was named
after the state oil company whose new headquarters occupied one half of the build-
ing. The building consisted of two identical towers 452 m in height and joined by a
sky-bridge at the 41st and 42nd floors (see Fig. 1.5). In addition to the Petronas
Towers, phase 1 of the Twin Tower included a Concert Hall accommodating the
newly created Malaysian Philharmonic Orchestra; a luxury hotel, the Mandarin
Oriental; two other office blocks such as Ampang Tower and Esso Tower; and a
50-acre ‘public park’ (Bunnel 2004). Phase 2 of KLCC International Zone
concentrates on the mixed-use urban living residential towers such as Troika
Residence and Binjai Condo (Fig. 1.6).
3 Mixed-Use Development Criteria in Kuala Lumpur City Centre International Zone

3.1 Variety of Uses

Urban areas are capable of accommodating a variety of primary and secondary uses or activities. The most significant criteria for the establishment of a mixed-use development is that the district must be multifunctional, that is, integrated with more than a single primary use in one place. Examples of these activities would include commercial, industrial, and residential uses. Jacob in 1965 made a similar argument in her book, *The Death and Life of Great American Cities* that an environment containing a number of primary functions will invite people outdoors at different times.
times for different purposes while using a variety of facilities at the same time (Jacobs 1965: 162). This simultaneously creates a variety of choice of activities and experiences for users generated by a mix of compatible uses in close proximity (Bentley et al. 1985).

However, variety cannot be achieved by a random amalgamation of activities on a site but rather a variety of uses that mutually support each other (Bentley et al. 1985). Some activities act as magnets attracting people to the site. Everyone has to go home and go to work hence concentrations of dwellings and workplaces are primary uses of spaces in the cities. Unlike primary functions in a development with a variety of uses, secondary uses are enterprises which lack pulling power to attract people, but they become functional by people drawn to the place by the primary uses (Bentley et al. 1985: 30).

Time is also an important element in the system of mutual support. It is not only necessary for secondary uses to be sustained by their associate primary uses. These mixture of uses as illustrated with the help of images below, must keep people in the area over a long period of time because of the manner in which time is spent between work and home (see Fig. 1.7).

Fig. 1.7 Graphic representation of variety of uses such as retail, various types of eateries, offices, playground, recreation, parks and accommodation, in the sketch map of KLCC master plan
3.2 Concentration of People/Density

There has been vigorous debate over the century of what constitutes ‘good’ or ‘bad’ densities. Howard (1902) and Abercrombie (1922) responded against Victorian overcrowding by proposing the Garden Cities concept with extremely low densities. Jacobs (1965) contested against this stating that high density stimulates a rich city life. In accordance to Jacobs’s theory, opinions are changing, especially as sustainability supports close living. Though, higher density is generally considered an ‘inferior’ attribute in the economic sense, New Urbanism’s main innovation with regard to density is to create a ‘superior’ asset: attractive, walkable mixed-use developments.

Density within the city’s mixed-use development must be sufficient to support the variety of uses and activities. Density is a crucial factor when measuring the environmental impact of development, because it affects land consumption, storm-water runoff, automobile usage, and transit usage. Increased density also leads to economies of scale to sustain the commercial component of the development (Alias et al. 2010). In KLCC international zone, developments are significantly more compact on average than conventional suburban development and comparable in density to historic urban neighbourhoods.

3.3 Mobility and Connectivity

Within every mixed-use development, there is need for coherent movement strategies. People within the development should be connected seamlessly to their destinations by having easy access to transportation facilities. It is imperative for the district to have closely grained mixed uses, particularly with important activities that support daily life. These activities include: housing, employment, shopping, education, socialising, healthcare and recreation. They should be within a comfortable walking distance from residences catering to the less mobile populace such as the disabled, elderly, children and other marginalised groups. A fine grained mix of uses further increases opportunities for marginal and part-time employment.

For a district to be permeable and accessible, all varieties of uses and activities must be within a 400 m radius creating a total distance of approximately 800 m diameter which equates to a 125 acre (50 ha) plot of land (Duany and Plater-Zyberk 1990; Perry 1982; Vale 1991; Urban Village Group 1991). Understanding how places function is entirely depending on the movement flow that is connecting people to places within and surrounding the development area. People chose their desired route based on route directness, route quality, safety, comfort and enjoyment while walking (Mastura 2013). To a certain degree, pedestrians agreed on the interesting aspects of certain routes in KLCC International Zone area as they cut through markets and outlets which create a curiosity while walking (see Fig. 1.8).
3.4 Safety and Security

Safety is a critical factor in a mixed-use development. Urban centres can be considered safe if it provides streets and spaces where fear of attack or harassment is significantly reduced. Studies have suggested that homogenous residential environments exhibit lower rates of crime than areas with mixed uses (Greenberg et al. 1982; Greenberg and Rohe 1984) challenging the ‘mixed use equals safety’ assumption held by New Urbanists (Cozens 2008). The mixed use of spaces can bring activities to many parts of the city creating natural surveillance that enhances security and creates a perception of safety within the urban environment. Many of a city’s safety issues are a result of separated land uses. Mixed-use developments in KLCC zone highly encourage social interaction and discourage crime with the provision of high-quality streets and squares that is safe, comfortable, and interesting to the pedestrian. Safety and security in KLCC International Zone are carefully configured to encourage the community to walking and enable neighbours to know each other and protect their communities (Figs. 1.9, 1.10, and 1.11).
Fig. 1.9 The view towards the KLCC parks with the map showing the greenery and scenery (Mastura 2013)

Fig. 1.10 The view towards the KLCC Park showing the softscape and hardscape for the outdoor activities for the community (Mastura 2013)
3.5 **Sustainability and Flexibility**

Urban developments can be considered sustainable if resource consumption, waste and pollution are minimised and kept below in levels that are maintainable. If the mixed-use development is fine grained with highly permeable streets and compact urban forms, the area will be sustainable. The development is considered sustainable if:

1. It is designed at human scale and compact enough to accommodate walkable streets for housing areas.
2. There are robust with buildings and spaces that can change and be adapted over
time to meet the emergent challenges and contribute to economic sustainability.

3. The development’s design is logically distinctive, respects the local context and
has a historical narrative within the urban fabric.

4. The energy and resource conservation is implemented within the built environ-
ment. For example, building materials, road construction, service infrastructure,
etc. make use of environmentally efficient means to conserve resources.

3.6 Open Space and Livelihood

Open spaces are considered as integral in the master plan of KLCC International
Zone that focuses to every inches of land whether enclosed or not, that is laid partly
or wholly for public use as a park, sport and recreational ground, pleasure ground or
walk or as a public square. The urban landscape in the middle of KLCC International
Zone was planned as a focal point for the urban community from within and around
the zone area to congregate in the outdoor spaces. KLCC parks attract a large vol-
ume of people who use the pathways for several reasons such as passing through to
get to their workplaces, homes, or recreation areas and for fulfilling their tourist
itinerary.

Open spaces that occur between compact developments serve as ‘green lungs’.
They remove the monotony of the concrete jungle and contribute with regard to
safety, social interaction and aesthetic opportunities of the development. Furthermore,
greenery is beneficial to the microclimate within the city, improving air quality and
noise levels. Way-finders in KLCC International Zone are very clear and accurate,
with little ambiguity, and they are placed at relevant spots throughout the area.

It appears that KLCC International Zone has embraced mixed-use development
principles surmised in Table 1.2 below.

4 New Urban Integrated Development in KLCC
International Zone

4.1 An Analysis Study of Troika Residence

The vision for Kuala Lumpur Structure Plan 2020 is to transform the traditional city
of Kuala Lumpur into A World Class City. Part of its development strategies that
highly need to be considered is creating the KLCC inner city into a living environ-
ment that promises business and working environments with international standard
of commercial and financial entertainment centre, a self-contained city complete
with medium to high end residential zone (CHKL 2004). This mission is meant to
attract the highest qualified expertise from both local and international citizens, to
live and work in the city and to bring in the World Class City activities of
international relevance and appeal to incorporating attractive living environment with high-quality facilities.

In Malaysia people are now beginning to realise the advantages of sustainable building and are now moving towards better and more responsible development. Study on Sustainable Concept Awareness in Malaysia by Nazirah and Aini (2013) showed the active promotion of sustainable development by the government, non-governmental organisations and education institutions in the past 5 years has shown some encouraging progress in this field.

The above factors have influenced the emergence of innovative high technology building designs with latest inventions in this exclusive zone of Kuala Lumpur. Special effort has been put into each development to address the public demand and

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Physical attributes</th>
</tr>
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<tbody>
<tr>
<td>Variety of uses</td>
<td>A mix of shops, offices, apartments and homes on site. Mixed-use within neighbourhoods, within blocks and within buildings A range of types, sizes and prices in closer proximity Diversity of people—of ages, income levels, cultures and races</td>
</tr>
<tr>
<td>Concentration of people</td>
<td>More buildings, residences, shops, and services closer together for ease of walking to enable a more efficient use of services and resources, and to create a more convenient, enjoyable place to live</td>
</tr>
<tr>
<td>Mobility and connectivity</td>
<td>A network of high-quality trains connecting cities, towns and neighbourhoods together Pedestrian-friendly design that encourages a greater use of bicycles, rollerblades, scooters and walking as daily transportation Interconnected street grid network disperses traffic and eases walking A hierarchy of narrow streets, boulevards and alleys High-quality pedestrian network and public realm makes walking pleasurable</td>
</tr>
<tr>
<td>Safety and security</td>
<td>The revitalization of urban places depends on safety and security. Streets and squares should be safe, comfortable, and interesting to the pedestrian Properly configured, they encourage walking and enable neighbours to know each other and protect their communities</td>
</tr>
<tr>
<td>Sustainability and flexibility</td>
<td>Minimal environmental impact of development and its operations eco-friendly technologies, respect for ecology and value of natural systems Energy efficiency Less use of finite fuels More local production More walking less driving Quality architecture and urban design that focuses on beauty, aesthetics, human comfort and creating a sense of places</td>
</tr>
<tr>
<td>Open space and livelihood</td>
<td>Open spaces between compact developments serving as ‘green lungs’ Partly or wholly for public use as a park, sport and recreational ground, pleasure ground or walk or as a public square Removes monotony Contribute with to safety, social interaction and aesthetic opportunities of the development</td>
</tr>
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</table>
the development requirement for this new urban integrated zone (Fig. 1.12). Troika Residence is one of them, a mix-used development of high luxury residence which was designed by Foster and Partner.

The Troika development scheme was commissioned to be managed by Foster and Partner in collaboration with GDP Architect as a co-architect in 2004 by the developer, Bukit Bandar Raya Developments Berhad (e-Architecture 2015). The choice of Foster + partner could effectively lead the branding of this Bukit Bandar Raya Berhad residential scheme globally. The popularity of Foster + partner’s name should endorse the image of a world class product which was not only well known as a market leader in terms of design, pricing and prestige but more of trust in bringing up the status of KLCC one in achieving its goal of providing a world class high end quality residence with new style of urban living.

4.2 Design Concept

As the first luxury mixed-use residential scheme in the precincts of Kuala Lumpur City Centre International Zone, Troika is located at the north-eastern corner of the KLCC Park (Fig. 1.12) within the Zone of Resident and Commercial Suites.
Buildings. It is encircled by HSC Medical Centre on the west, The Corinthian Residential on the north and on the east side is Jalan Binjai Residence.

Troika was built on 8600 m$^2$ site of KLCC prime land at the intersection of Persiaran KLCC and Jalan Binjai (Fig. 1.13). It was developed with 95,000 m$^2$ gross area and total floor area of 75,000 m$^2$ which was divided into three blocks. This exclusive mix-used residence was designed using precast concrete shear walls which framed a landscaped courtyard that linked to the KLCC Park. The shear walls were arranged as internal and external support of the three blocks. The layout planning of the three blocks was based on the result of analysing the site context and surrounding building, taking advantage of the South West green view of the KLCC Park and avoiding the traffic noise from the North East site (Fig. 1.14) (e-Architecture 2015).

This layout of twisted geometry of three sculptural towers (Fig. 1.16) is the result of a process-driven design concept that maximises the dramatic views of the KLCC Park, the KL Towers and the surrounding cityscape (Fig. 1.15). The unusual external and internal main structure, consisting of a number of slender shear walls, supports a series of stacked blocks that sensitively rotate to frame the prime outlook for each apartment. The slim blade shear walls intelligently arranged and rotated the privately exclusive units that shade one another (Fig. 1.16).

The balcony overhangs and the massive curtain wall system applying low-E glazing were purposely implemented to control the internal heat gain.

At ground level, a 4-storey perimeter building circles a peaceful courtyard as a centre of the development and this enclosure partially opens towards the KLCC park. Shops and offices at this lower building are benefiting from the views and clean atmosphere of the landscaped courtyard, and connects the residents to KLCC.
This extended green provides a clear path connecting KLCC park towards the entrance of the units through the individual tower lift.

The Troika incorporated three glass-clad residential towers of varying heights: the highest tower is 240 m with 50 storeys, while the other two towers are 160 m.
high with 38 storeys, and 177 m with 44 storeys. The three towers feature two double-volume glass-encased bridges connecting a sky lobby at the 24th floor (Fig. 1.17) with an incomparable panorama of the fast-changing Kuala Lumpur skyline (Fig. 1.18).

The three elegant towers of Troika provide 230 units of exclusive apartments including 164 various types of luxurious condominiums, 8 penthouses, 57 SOHO units of which are serviced (SOHO an acronym for Small Office Home Office).
SOHO is a unit that provides the ultimate in flexibility, designed for use either as an office, an apartment or a combination of both. The tower also complemented with retail outlets, boutique offices and restaurants. It is an integrated development, a self-contained setup that tries to reflect the identity of the high end luxury new urban lifestyle in Kuala Lumpur City Centre, an exclusive one.

The shear walls defined the internal organisation of the apartments where the volumes grow and shrink within the shear walls. There are 230 units, all with primary living areas focused towards the prevailing views. Many areas are self-shaded by the overhang that provides shelter to the balconies below (Fig. 1.19).
4.3 Sustainability Approach on Building Design

Layout of the twisting geometry of the towers (Fig. 1.20) which responds organically to neighbouring buildings, solar orientation, and distant views reflects a strong identity of the site. The open link courtyard is facing and connected to the KLCC Park. It created its own microclimate, where shade and wind-driven through the open link courtyard.
landscaped courtyard naturally filtering the outdoor polluted air effected by the traffic (Fig. 1.20), tempering the excessive tropical humid and heat naturally to the apartments when the weather allows (RIBA 2012) (Figs. 1.21, 1.22, 1.23, and 1.24).
The core orientation of each tower is towards the centre east to provide 100% space efficiency and flexibility of the layout floor planning. Furthermore the site plan showed how the three towers’ blocks could be functioned as a parameter barrier to buffer the noise coming from the road site and heavy traffic of the Tun Razak highway. The intricately twisted geometric slender concrete shear walls also meant to function as vertical shading device to shade the opening that focuses towards North West orientation, it partially screens the penetration of solar radiation from coming...
directly into the building but providing sufficient day-lighting. The application of Low-E glass as curtain wall cladding helps in reducing the heat gain affected by the west orientation opening (Fig. 1.25).

The strong character of the slim shear wall divided each floor into spaces with its own language featuring a firm statement of Troika high technology building identity. The twisted geometrical shear walls with natural finish given each space its own quality which is able to communicate with the active urban citizen as the way the lobby entrance welcomes visitors toward its own enclave and defined the space by the two shear walls. This uniqueness in the new style of urban feature design was recognised by RIBA and RIBA news (2012) that mentioned that Foster + Partner has come out with a very daring attempt to find a new functionally driven form for high-density urban living in tropical climates combining (Fig. 1.26).

4.4 Innovative Structure and Construction System

Environmentally sustainable building construction in Malaysia has experienced significant growth during the past 10 years. The public is becoming more aware of the benefits of green construction. Abidin (2010) in her article Investigating the Awareness and Application of Sustainable Construction Concept by Malaysian Developers, revealed that several large developers in Malaysia are beginning to implement the sustainable construction concept, as the large companies have the
capability (capital, experience and expertise) to apply sustainable principles in their project.

As one of the strong developer companies in Malaysia, the developer of The Troika shared all the construction process challenges with the contractor of the project. All aspects of environmental sustainability were considered to fulfil the development requirement of providing and maintaining the high-quality environment of KLCC exclusive zone. The environmental policy and the site constrain required a well-planned project and site handling. Environmental protection during construction process was one of the very important aspects to be considered in sustainable building construction (Foong Kok 2012). The site constrains and the unusual design of the building required a well-organised construction plan and site handling started from the early planning stage.

The aim of the developer was to build the highest residential tower in KLCC International Zone. The constrains of the project site have provoked and motivated a stronger teamwork. The maximum height that concrete shear wall could reach is 200 m; the team work found an innovative way to construct a 240 m-high slender blade concrete shear wall for the tallest block of Troika Residence and set a new standard of height of 240 m for concrete shear wall.

In order to address the issue, the construction work adopted the Rail Climbing System (RCS) of construction, where the shear wall is being constructed ahead of the slabs. Only when three storeys have been completed, the slab work began.
This system reduces the duration of time required per floor to seven working days (Bhatia 2012). To make the system work, the contractor has to work hand-in-hand with the formwork designer who suggested of applying reusable steel formwork to replace timber (Figs. 1.27 and 1.28). In order to address the issue, the construction work has adopted the Rail Climbing System (RCS) of construction, where the shear wall is being constructed ahead of the slabs. Only when three storeys have been completed, the slab work began. This system reduces the duration of time required per floor to seven working days (Foong Kok 2012). To make the system work the contractor has to work hand-in-hand with the formwork designer who suggested of applying reusable steel formwork to replace timber. This teamwork allows maximum expression of interaction among those involved in construction work and produces a high-quality of construction work. The involvement of formwork specialist who designed the durable and eco-friendly formwork, help the contractor to overcome the site constrains and comply with the detailed requirement development policy of Kuala Lumpur City Centre zone.
5 Conclusion

The goal of uplifting the role of Kuala Lumpur as an emerging international financial and commercial centre was achieved through the adoption of new art of urban living as translated into the city master plan. The city was first demarcated into zones with buildings carried to the perimeter of the cities surrounding greenery areas. Thus, the need to connect points with safety and security of pedestrian users comes into pur-view. The segregation of non-motorised travel (NMT) pattern was adopted to enhance walkability of the city with sustainability goals. Therefore, Mix mode of transportation was incorporated into the design. Mix mode of transportation has the potential to attract people when planned appropriately because it is transit-oriented. Thus, it enhances commercial activities and curtails car dependency. It also serves to reduce carbon footprint in the drive for global sustainability. Thus adequate measures were put in place even though with high-cost infrastructural investments to enhance pedestrian walkability using the new art of urban living.

Similarly, the concept of troika residence adopted within the KLCC Integrated development is an essentially self-contained approach. Made to spread over 2.13 acres, 2 min walk is achievable from the Ampang Park LRT station (250 m), and just a little further away is KLCC (400 m). Conclusively, the Troika design concept was directed towards attractive new living concept that serves to bring people back to the new art of urban living. Through high investment cost but with overarching
goal endorsed by the desire to meet the international standards of living with sustainability drive, efficiency, and equitable city structure, which translates into quality of life of the inhabitants. This was achieved through strategic urban master plan. These however need to be maintained and sustained. The extension of greenery serves to enhance the green life concept for effective livelihood and is paying dividends through its attractiveness of people as planned.

References


Bhatia (2012)


Ismail WHW, Shamsuddin S (2005, September) The old shop houses as part of Malaysian urban heritage: the current dilemma. In: 8th International Conference of the Asian Planning Schools Association, pp. 11–14
1 Kuala Lumpur City Centre Integrated Urban Development Zone…


## Author Queries

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