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Green Corridors for Liveable and Walkable City: a Case of Kuala Lumpur

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The concept of sustainability embraces the conservation of the environment, cultural preservation, economic stability and overcoming of social problems. To ensure urban sustainability, one of the crucial factors is the environmental health, in which the environment should be kept in the best condition in developing countries thereby leading to reduction of environmental pollution. Green corridors in cities are one such way to ensure that the green areas are being used optimally. Such studies do exist in Malaysia but there is no established and published implementation. There is a need to analyse and study the current problems of the existing green corridors plans. This paper helps to visualise all the six suggested routes of the green corridors that had been made in Kuala Lumpur city. It discusses the opportunities and limitations of the plans as well as ways to improve for a successful implementation of green corridors in Kuala Lumpur.

1. Introduction

Most countries in Asia, including Malaysia, have undergone rapid urbanisation. To realise the vision of becoming a developed country, industrial, transportation, and residential activity have led these countries to develop at the expense of large scale land clearances (Kanniah, 2017). There have been problems with these clearances that lead to fragmentation of green areas (Ayram et al., 2016). Green areas include open spaces, forest reserves, parks, cemeteries and water bodies such as lakes and rivers. Since green infrastructure provides various ecosystem services and functions to urban residents, they must be conserved and protected. As the human population will continue to grow in the future (Figure 1), Kuala Lumpur City Hall needs to produce enough green space for the people as it is critical for the liveability of its residents and to achieve top 20 liveable cities as aspired by KL. One way is to connect the fragmented patches to provide enough green space of at least 16 m^2 per person.

Urban forests, for example, have been shown to reduce urban surface temperature (Sheikhi et al., 2015) sequester and store atmospheric carbon dioxide (Kanniah, 2016), remove air pollutants (Nowak et al., 2013), manage storm water (Gogate et al., 2017) and provide habitat for urban flora and fauna (Karuppanan et al., 2014). Many cities around the world have taken various efforts to protect (Rafael et al., 2017) and restore green infrastructure in cities (Zardo et al., 2017). One of the effective strategies is to connect all fragmented patches of green spaces to form larger and connected spaces. Such spaces are essential not only to provide a linked space for fauna to move freely but also to provide a green corridor for urban dwellers to walk from one place to another in the city. This will reduce the use of vehicles in the city centre which will subsequently lower CO_2 emission. Many countries have committed to these greening efforts, including Kuala Lumpur, Malaysia, which began promoting green spaces with the design of small scale gardens in 1880 and gradually evolving to the large scale gardens (National Landscape Department, 2012). In line with the country's vision to develop Malaysia into a Garden Nation by 2020, the agenda is to connect all these green spaces, pedestrian walks and transportation networks effectively by creating green networks. Apart from green spaces, river corridors were also included as part of the green networks development in Malaysia (National Landscape Department, 2012). This very same idea was also stated in Kuala Lumpur Structure Plan 2020 where in the year 1984, the

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plan visualised a continuous green network in Kuala Lumpur. The plan aims to connect all open spaces at landmarks such as Dataran Merdeka, Kuala Lumpur City Centre (KLCC) and Kuala Lumpur Tower situated in the city centre by planting trees along the streets as one of the efforts by Kuala Lumpur City Hall as stated in Kuala Lumpur Structure Plan 2020 (Kuala Lumpur City Hall, 1984).

This green corridor planning still has not been implemented. Six green corridors have been suggested by Kuala Lumpur City Hall and from a PhD thesis, (Yusoff, 2013). In the next section of the paper, the current problems of the existing green corridors plans are analysed and studied. All the six suggested routes of the green corridors that had been recommended for Kuala Lumpur city previously are visualised and discussed whether they are suitable or not to be implemented. The opportunities and limitations of the plans as well as ways to improve for a successful implementation of green corridors in Kuala Lumpur are also discussed.

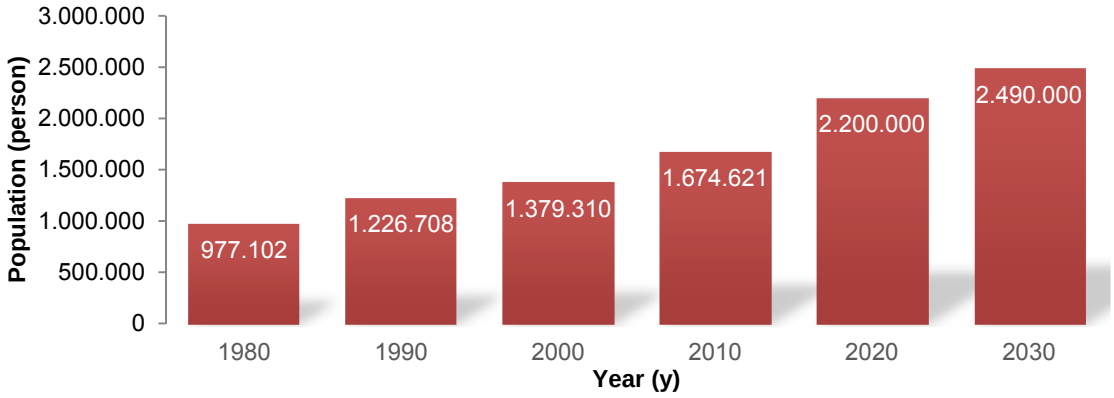

Figure 1: Kuala Lumpur population projection (Department of Statistics Malaysia, 2017)

2. Study Area

The study focused on Kuala Lumpur that covers 243 km^2, as shown in Figure 2. Kuala Lumpur was chosen as the study area because it is a rapidly developing city that has witnessed a great loss of green space due to high industrial/housing activities (Kanniah and Ho, 2017). According to the Kuala Lumpur City Hall, many patches of green area have been created from the human activities which will ultimately lead to the formation of habitat patches and endangerment of flora and fauna. These could be prevented with the implementation of the green corridors.

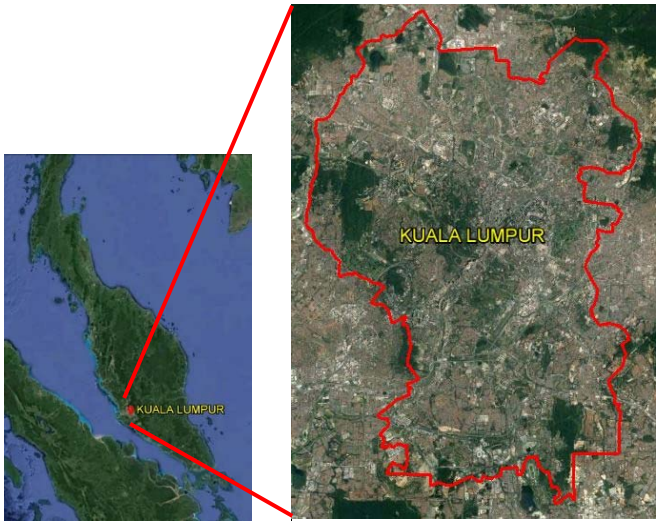

Figure 2: Kuala Lumpur as the study area

3. Data and Methods

In this study, the green corridor plans which have been recommended for Kuala Lumpur area were analysed. There are two sources of the green corridor plans, (1) Yusoff (2013) and (2) Kuala Lumpur Structure Plan 2020. Both sources recommended three corridor routes each producing six different routes of green corridors. The details of the routes are provided in Section 3.1. All the recommended routes not only connect one green space to another but also include connecting the famous landmarks in the city. After getting the details of all the six routes, the places were pinned in the Google Earth (2016). The multiple pins were then connected using the ruler tool available in the software. The ruler tool provides information of length/distance from one pin to another pin, the slope and the topology along the route. The same step was repeated for the other five routes. For the water features information, all the places that have been pinned in the Google Earth were zoomed to determine whether water bodies exist in the area.

3.1 Proposed Green Corridor Routes by Kuala Lumpur City Hall and Yusoff

The first corridor located at the city centre, as illustrated in Figure 3a, connects Bukit Kiara and Bukit Gasing to Perdana Lake Garden, Bukit Nanas, Kuala Lumpur City Center (KLCC) Park and Permaisuri Lake Garden in Sungai Besi. For the second corridor, as illustrated in Figure 3b, it starts at Bukit Gasing, heading to Universiti Malaya (UM) and towards Bukit Kiara. This route was quite far from city centre and located near Damansara area. The third green corridor is in city centre, as illustrated in Figure 3c, is from KLCC Park to Bukit Nanas Forest Reserve and heading west to Padang Merdeka, National Mosque, KL Bird Park, via museum area to Perdana Lake Garden. For the fourth green corridor, it is located near Bukit Bintang area, as illustrated in Figure 4a, Jalan Davis Park and KLCC Park can be maintained as green linkage of Royal Selangor Golf Club (RSGC) and Taman U-Thant. The fifth green corridor was also in the city centre area, illustrated in Figure 4b, connects Jalan Tun Razak and Taman Tasik Titiwangsa by using Sungai Bunus corridor. The sixth green corridor, as illustrated in Figure 4c, suggested using existing tree covers in Bukit Petaling, Kampong Attap and the Chinese cemetery areas. The green linkage can extend until City Centre through Stadium Negara and Stadium Merdeka. This route is located near KL Sentral area which is famous with tourists.

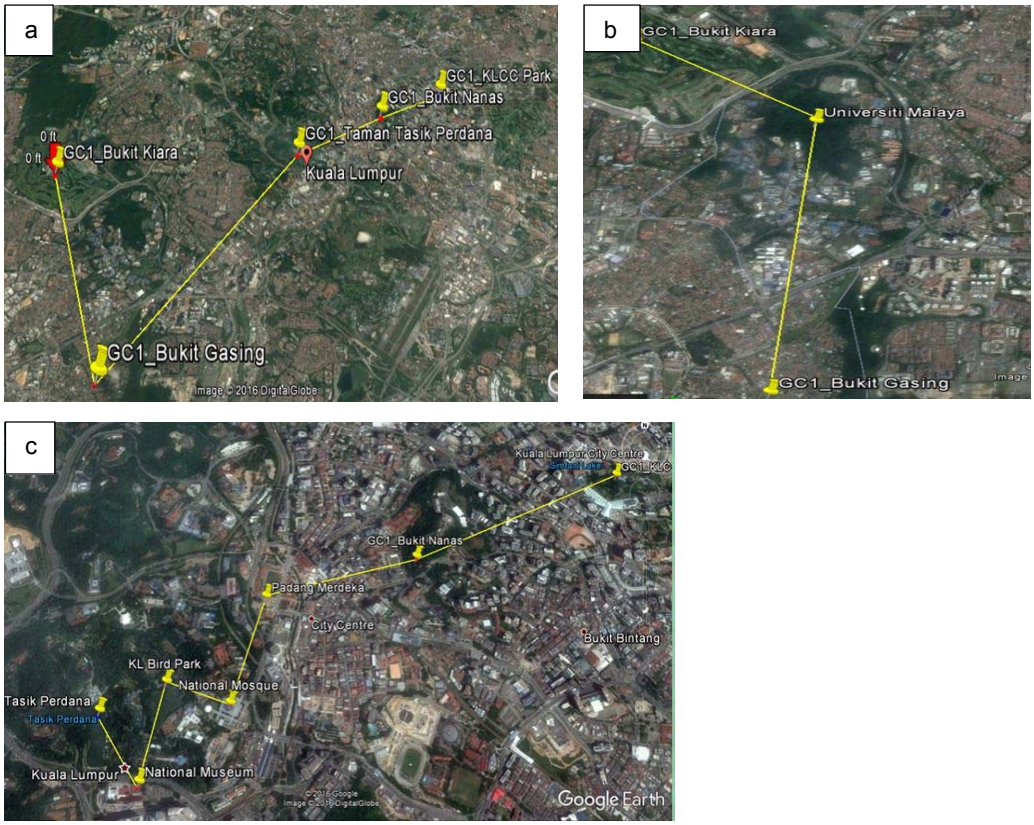

Figure 3: Green corridors routes as suggested by Yusoff (2013)

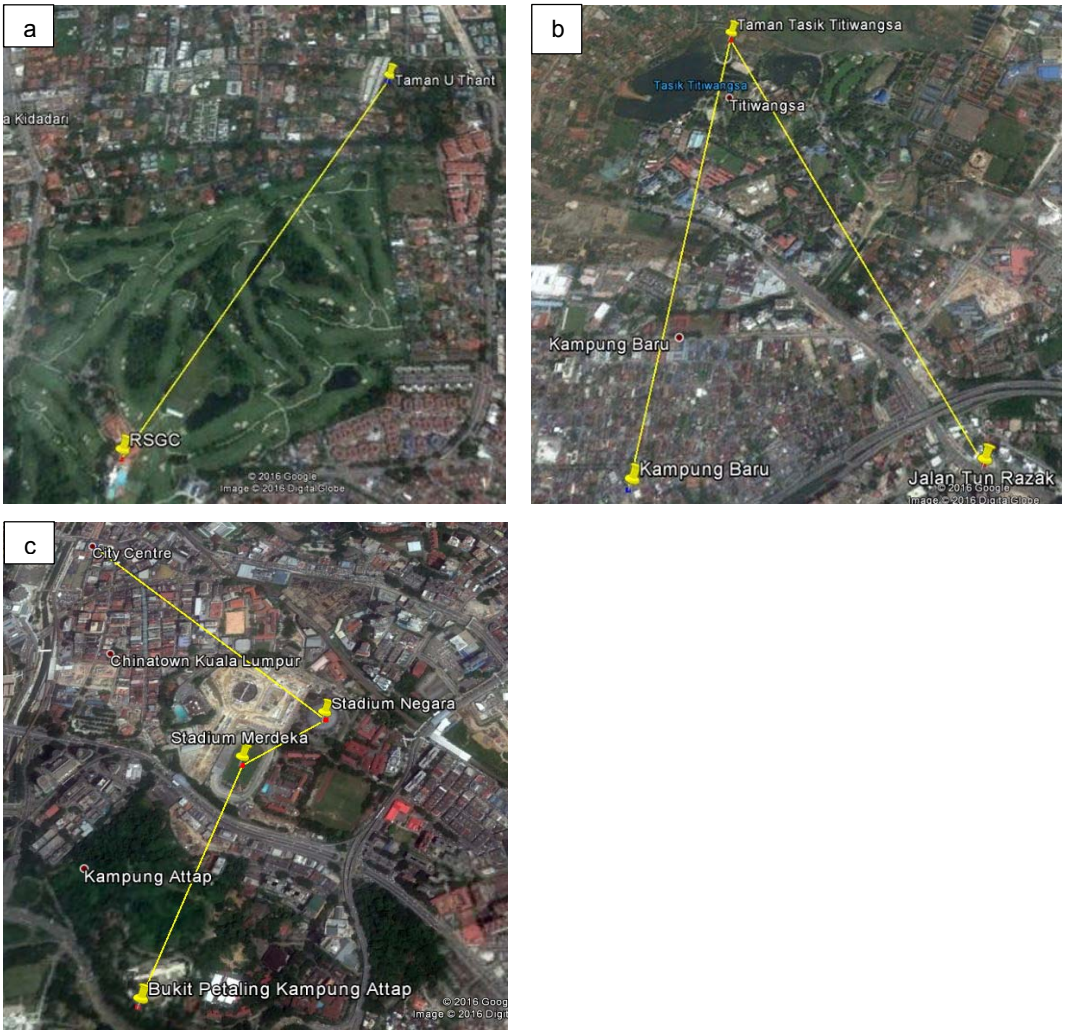

Figure 4: Green corridors routes as suggested by Kuala Lumpur City Hall

4. Results and Discussions

In connecting two green spaces together, some important parameters must be taken into consideration to ensure that the green corridors are well- connected and follow the appropriate guidelines set by Federal Department of Town and Country Planning. This is important especially in the aspect of safety, usefulness and ease of maintenance. One of the important parameters is accessibility distance. The distance will ensure that the corridors or networks will be used well, especially by the people. According to Bristol's City Council (2008), suitable distance to connect to the nearest green spaces is 400 meters (known as the distance that a crow flies), which is equivalent to nine minutes walking, which is considered as a walkable distance for city dwellers. In Malaysia, 500 m distance is considered as walkable distance (Federal Department of Town and Country Planning Peninsular Malaysia Guideline, 2013).

Apart from that, another parameter that should be considered for green corridors is the width. The width need to be less than 1 km to create enough space to achieve gene flow and supporting the ecological process. (Bennet, 2003). The width cannot be too wide or too narrow as a too wide corridor will confuse the animals with the existence of a network, while a too narrow corridor will create a stress condition to the animals (Personal communication with Mr. Boyd Head of Environment, Iskandar Regional Development Authority (IRDA), 2016). Another important parameter is the topology and slope. The flat terrain ranging from 0 to 6 % as mentioned by JPBD will be safer for people to use while undulating topology and steep slope will be hard for people as well as animals to move from one place to another.

4.1 Preliminary Results of Green Corridor Analysis in Kuala Lumpur

The summary of the preliminary results of the recommended green corridor route analysed in this study is tabulated in Table 1. In this paper, the analysis was limited to only four available parameters which are slope, topology, distances and the existence of water features because these are the parameters that can be visually analysed from the Google Earth images.

Table 1: The results on slope, topology, distance and water features analysed from Google Earth data of the year 2016 (Google Earth, 2016)

Green Corridor Route	From - To	Max Slope (%)	Topology Min - Max (m)	Distance (m)	Water Features
1	Bukit Kiara - Bukit Gasing	6.3	35 - 92	4,252 m	No
	Bukit Gasing – Taman Tasik Perdana	13.1	47 - 107	5,662 m	Yes
	Taman Tasik Perdana – Bukit Nanas	20.0	31 - 76	2,061 m	Yes
	Bukit Nanas – KLCC Park	15.2	36 - 68	1,537 m	Yes
2	Bukit Gasing – UM	16.1	37 - 96	3,006 m	Yes
	UM – Bukit Kiara	18.0	54 - 109	1,867 m	No
3	KLCC Park – Bukit Nanas KL Tower	15.5	37 - 68	1,496 m	Yes
	Bukit Nanas KL Tower – Padang Merdeka	20.3	31 - 68	974 m	Yes
	Padang Merdeka – National Mosque	10.2	32 - 52	654 m	Yes
	National Mosque – Bird Park	25.8	42 - 75	397 m	Yes
	Bird Park - Museum	11.3	43 - 70	539 m	Yes
	Museum – Perdana Lake Garden	14.6	45 - 57	457 m	Yes
4	Royal Selangor Golf Club (RSGC) - Taman U-Thant	9.2	43 - 49	1,581 m	Yes
5	Jalan Tun Razak - Taman Tasik Titiwangsa	8.5	31 - 49	2,141 m	Yes
	Kampong Bharu - (via Sg Bunus)	20.9	32 - 68	1,044 m	Yes
6	Bukit Petaling Kampong Attap - Stadium Negara	15.3	43 - 62	979 m	No
	Stadium Negara - Stadium Merdeka	10.5	45 - 61	284 m	No
	Stadium Merdeka – City Centre	18.5	33 - 77	2,338 m	Yes

All green corridor routes focus on the places of attraction in Kuala Lumpur (Table 1). All the topology from one place to another is undulating which is not really suitable for a green corridor. According to Federal Department of Town and Country Planning Peninsular Malaysia Guideline on Park and open space, the maximum allowed slope is 6 % to create a good design. The analysis shows that the slope degree ranges from 6.3 % to 25.8 %, which are not considered as good values. Many of the attractions are too far from each other and are not considered as walkable distance at all. There were some routes with walkable distances; from National Mosque to Bird Park with 397 m distance, Museum to Perdana Lake Garden with 457 m distances and Stadium Negara to Stadium Merdeka with the shortest distances of them all with only 284 m. The distance of other routes ranges from 1.5 to 5.6 km. These distances are obviously unsuitable to both people and animals. To ensure that green corridors can be redesigned in a good way, important parameters must be followed especially for the accessibility distance.

Out of all 18 places of green spaces for the green corridors routes, only four of them have no water features which show a good number of water bodies present in Kuala Lumpur city. Existing water features is one of the good criteria for green corridors, especially in terms of biodiversity, as these areas can become their habitat and sources of water and food as well as a medium of cooling effect for the place (Rasli et al., 2016). In Kuala Lumpur Structure Plan, they addressed the issue on incomplete green corridors in KL. This is because although Malaysia has established parks, small parks and gardens, there are still many places that are not equipped with facilities to connect these green areas and the networks are not fairly distributed.

Finally, some human-related obstacles along the pedestrian walk ways are one of the limitations in implementing green corridors in Kuala Lumpur (Kuala Lumpur Structure Plan 2020). These obstacles include unlicensed hawking activities along the pedestrian walks and private buildings, which block free access of the public. This has led to narrower and almost no space for them, becoming one of the limitations in implementing complete green corridors. Another issue is the limited protection from rain and sunlight for the pedestrian. Thus, pedestrian protection is one of the important parameters for having a good green corridor.

5. Conclusion

To ensure green corridors can be implemented successfully, limitations must first be addressed so that further actions can be proposed and taken to design successful and continuous green corridors in Kuala Lumpur. Developing the connectors of park in the built-up area is a crucial one yet difficult. One of the obvious problems is the accessibility distance which is too far and not suitable for a good green corridor. For a route which is too far, attraction spots can be designed in between to encourage more people to use the green corridors. These attraction spots can be a café, pocket parks as well as gazebo for people to rest. As there are problems on the space and blocked area for the pedestrians, this can be solved if the municipality can take action on illegal hawking and private property owners so that the space which is reserved for the public can be returned to them. Hence, the routes for successful green corridors can be utilised well.

Acknowledgment

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