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The Evaluation of Green Infrastructure Elements to Enhance Green Neighbourhood Park in Shah Alam, Selangor

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ABSTRACT

Green infrastructure is an effort of countering the negative impact caused by the climate change and urban sprawl. This green infrastructure basically consists of diverse green spaces which are interconnected and linked by the streets, waterways and drainage network in urban areas. The purpose of the study is to apply the implementation of green infrastructure concept as a medium to enhance the neighbourhood park using green infrastructure concept and principle in Section 6, Section 7, and Section 8, Shah Alam. The analysis has been done to determine the current provision of green infrastructure elements within the study area based on the concept of green infrastructure. Green infrastructure consists of several components that work and function together to maintain the green network of physical environment. The components refer to the combination of hub and links where hub is the neighbourhood park and link is the landscape and pedestrian walkways. The level of green infrastructure is assessed through site inventory on aspects of provision, maintenance, accessibility, and image/character. The outcomes of the analysis are used to evaluate the efficiency of current provision of green infrastructure in enhancing the neighbourhood park in the study area before proposing an improvement provision of green infrastructure within the study area. The findings could be used by local authority to formulate plan and guidelines in developing infrastructure and facilities that fulfill green infrastructure elements to enhance the neighbourhood park.

Keywords: *Green infrastructure, Neighbourhood park, Site inventory*

INTRODUCTION

Climate change which is faced by many countries nowadays has been closely related with the process of urbanisation or urban sprawl. Thus, smart growth and smart conservation has been identified as one of the approaches that can be applied in our effort to combat and counter the urban sprawl (Suzuki & Moola, 2010) of which causing imbalanced land development and distribution. Urban sprawl has been identified as the culprit for inability to conserve green spaces, lower economical effectiveness for investment in infrastructure and other environmental and socio-economic issues. One of the smart growth and conservation approaches that can be implemented is the Green Infrastructure Network concept which is part of the Green Technology. It has been identified as a tool that can enhance neighbourhood parks. Green infrastructure is an approach of providing improvement in infrastructure provision such as tools of networks and linkages of green spaces. This green infrastructure basically consists of diverse green spaces which may be linked and connected by the streets, waterways and drainage network in urban areas (Tzoulas, 2007).

This paper aims to exemplify an effort by a group of students doing their Master's coursework in evaluating elements of green infrastructure as a catalyst of green neighbourhood park development. The purpose of the study is to apply the implementation of green infrastructure concept as a medium to enhance the neighbourhood park using green infrastructure concept and principle in Section 6, Section 7, and Section 8, Shah Alam. The neighbourhood parks lack green elements and no linkages of landscape and pedestrian walkways between the neighbourhood parks in Shah Alam. The analysis has been done to determine the current provision of green infrastructure elements within the study area based on the concept of green infrastructure which is hub and link. The data collection was done through site inventory based on aspects of provision, maintenance, accessibility, and image/character. The assessment was made using Likert Scale based on self assessment of enumerators through non participant observation on study area. The output of the analysis is to provide connection between neighbourhood park as hub and pedestrian walkways and landscape as link.

LITERATURE REVIEW

According to Town and Country Planning Association, UK (2010), Green Infrastructure is the sub-regional network of protected sites, nature reserves, green spaces, and greenway linkages. The linkages include river corridors and flood plains, migration routes and features of the landscape, which are of importance as wildlife corridors. Conservation Fund, 2009, defines green infrastructure as a network of natural areas and open spaces—such as woodlands, wetlands, trails and parks—that conserves ecosystems, helps sustain clean air and water and provides many other benefits to people and wildlife. Green infrastructure should provide for multi-functional uses i.e., wildlife, recreational and cultural experience, as well as delivering ecological services, such as flood protection and microclimate control. It should also operate at all spatial scales from urban centres through to open countryside (Town and Country Planning Association, UK, 2010).

The term green infrastructure is used to improvise different approaches from the traditional conservation practices and strategies which diversify the old perception regarding the green space planning and protection. According to Benedict and McMahon (2009), diversified perception of green space through this concept is "green spaces as something that we must have where protecting and restoring our environment and resource is a necessity rather than amenity". Besides that, green infrastructure also changes the common and traditional perception regarding green space which is traditionally an isolated space to interconnected spaces that form a system of protection and management. Thus it will give ecological benefits provided to the people and the environment itself. This environmental concept also emphasised on the needs to maintain the green space actively and monitor from time to time rather than leaving it alone without being manage (Benedict & McMahon, 2009). Green infrastructure provide practical ways to plan the environment which can be done by recognising that significant green spaces can contribute in producing better quality of life.

Basically, green infrastructure form consisted of several components that work and function together to maintain the green network of natural environment. These components are diverse in shape and size depending on the type and size of resource being protected. The ecological importance of

natural features within each component determines the level of conservation required protecting these resources and simultaneously the interaction between human and his or her natural environment (Williamson, 2003). These components refer to the combination of hub and links where there can be more than one (1) hub and more than one (1) link.
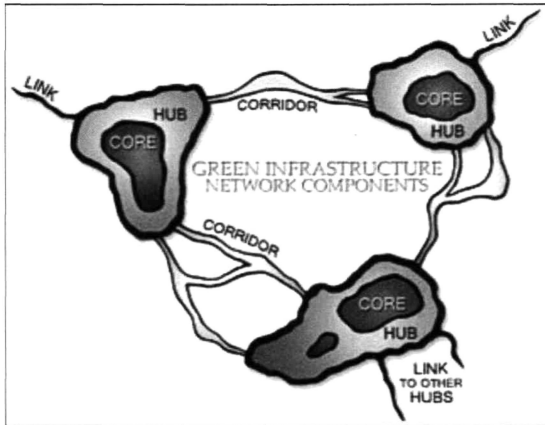
Figure 1: Conceptual Green Infrastructure Diagram: A Network of Core Areas, Hubs and Corridors
(Adapted from Weber et. all, (2011). Landscape and Urban Planning, Volume 96, Issue 4, 30 June 2012)

A hub is an anchor to the green infrastructure network where this hub provides the origin and destination for wildlife and ecological process movement. A hub according to Benedict and McMahon (2009) can be a reserved and protected area such as national park, and working lands such as farms. This includes regional parks, parks and open spaces at all national, state, regional, country, municipal and private level that may provide opportunity for recreation and protection of natural resources. While links refer to connections that tie the system together and allows the green infrastructure networks to work. The links can be in various sizes and forms which includes a landscape linkage of a large protected area that connects existing parks or natural areas. The connection will provide adequate space for flora and fauna to flourish while functioning as a corridor that connects ecosystem and landscape (Benedict & McMahon, 2009). Landscape linkage may also provide space for recreation use. Links also refers to the greenways and greenbelts which function as framework for

development while preserving the ecosystem. Conservation corridor such as river or stream functions as biological base for wildlife besides providing the opportunity for recreational activities.

ANALYSIS AND FINDINGS

This inventory approach focused on the provision of green infrastructure elements within the study area (Section 6, Section 7 and Section 8 in Shah Alam) which contributes to the potential of green infrastructure network within the areas thus enhances the liveable community. This green infrastructure element inventory will be divided into two main aspects of green infrastructure that is the hub and the link. Hub is Neighbourhood Park whereby an assessment of provision, maintenance, accessibility, and image/character will be conducted. Link is analysed based on the provision of landscape and pedestrian walkway, maintenance and connectivity. The Likert's scale method are based on ordered response options by Renesis Likert (1932) that will indicate the level of provision for green infrastructure in the study area. Likert's Scale refers to five ordinal measurement [One (1) to five (5)] which is 1-Very Poor, 2- Poor, 3-Fair, 4-Good, and 5-Very Good that will be used to indicate the current provision of green infrastructure.

SITE INVENTORY OF GREEN INFRASTRUCTURE ELEMENT

An Analysis for site inventory will be based on the elements of green infrastructure concept that encourages and enhances the liveable community within the study areas. This approach will indicate whether the study areas (Section 6, Section 7 and Section 8 in Shah Alam) consist the elements of green infrastructure as a medium for liveable community as indicated by the linkages of the hub and link elements.

Hub of Green Infrastructure

A hub refers to an anchor to the green infrastructure network where this hub provides the origin and destination for wildlife and ecological process and movement. In these study areas the Neighbourhood Park and open

spaces such as field that existed around the areas is the hub for recreation and protection of the natural resources.

Neighbourhood park

Neighbourhood Park is one of the green elements that existed in any built environment as part of an initiative to provide spaces for recreation and social interaction besides enhancing the balance between physical development and environment. Neighbourhood Park also provides opportunity to preserve the natural elements such as beautiful landscapes, water elements or greenways which become part of the green infrastructure components. This neighbourhood park can become the hub for the green infrastructure network which functions as the origin and destination of ecological process within the study area.

Table 1: Provision Level of Neighbourhood Park Around Section 6, Section 7 and Section 8 in Shah Alam

	Section 6					Section 7					Section 8				
Aspects	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Provision		■						■				■			
Maintenance			■				■				■				
Accessibility				■					■					■	
Image/ Character	■					■					■				

5 – Very good	(The provision level of Neighbourhood Park in term of its facilities is very good besides well maintained. The location of the Neighbourhood Park also provides good accessibility to the local people where people can walk to the park. The Neighbourhood Park also has a clear unique character and image).
4 – Good	(The provision level of facilities in the Neighbourhood Park is good and well maintained. The location of the park located is near to the neighbourhood and accessible by private vehicles. The park also has its own image and character).
3 – Satisfactory	(The provision and maintenance level of facilities in the neighbourhood park is satisfactory. The location of the park provides fair accessibility level to the neighbourhood besides having a fair image of the park).

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2 – Poor	(The facilities for the park are poorly provided and maintained besides the location of the park encourage the usage of private vehicles. The park did not have a specific image or character).
1 – Very poor	(The Park did not provide facilities or all facilities cannot function well because of poor maintenance level. It is difficult to find and come to the park which requires people to depend on vehicles. The park also did not have a specific character or image).

Based on the observation that has been made in Section 6, Section 7 and Section 8 in Shah Alam, the level of provision for Neighbourhood Park as the hub for green infrastructure network in the study areas are still lacking of facilities. This has resulted in these parks being unable to attract many local people to use these spaces for social and recreation spaces. While in term of maintenance of the park, the park in Section 8 is poorly maintained especially in term of its facilities while both in Section 6 and Section 7 are satisfactorily maintained and functioned.

From the observation, it can be seen that these Neighbourhood Parks provide a good level of accessibility to the people where people who live nearby can come to the park by walking which will encourage more walkable environment to the neighbourhoods. Unfortunately, it can be concluded that all three Neighbourhood Parks still lack of specific character and image which can provide or enhance the sense of place to the park.

Link of Green Infrastructure

Links refer to connections that tie the system together and allow the green infrastructure network to work. The links can be in various sizes and forms. This includes a landscape linkage which refers to a large protected area that connect existing parks or natural areas which provide adequate space for flora and fauna to flourish and grow. At the time, it acts as corridor that connects ecosystem and landscape. The link element in the study areas refers to the link of landscape and pedestrian walkway provided around the three neighbourhoods which function as linkages that connects between neighbourhood parks.

Landscape
Landscape is defined as visible features of an area of land, including the physical elements of landforms, water bodies such as rivers, lakes and

the sea, living elements of land cover including indigenous vegetation, human elements including land uses, buildings and structures, and transitory elements such as lighting and weather conditions. Landscape also includes the vegetation and flora elements that is provided in the neighbourhood particularly along the road network. Landscape elements are closely related with pedestrian network where both elements can encourage more walkable environment and reduce the dependency of vehicles. This condition meets one of the objectives of the livable city (community).

Table 2: Provision Level of Landscape Around Section 6, Section 7 and Section 8 in Shah Alam

Aspects	Section 6					Section 7					Section 8				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Provision				■					■				■		
Maintenance			■						■				■		
Connectivity				■					■			■			

5 – Very good	(The provision of landscape is adequate which is able to encourage walkable environment in all or most of the area. The maintenance of landscape is in a very good condition and it is able to enhance the visual aesthetic of the area. The provision of landscape is able to form a connection of network).
4 – Good	(The provision of landscape is able to encourage walkable environment in majority of the area. The maintenance of landscape is able to enhance the visual aesthetic value to the area. The provision of landscape is able to form a connection in most of the area).
3 – Satisfactory	(The provision of landscape satisfactorily encourages walkable environment in the study area. The maintenance of landscape satisfactorily enhances the visual aesthetic value to the area. The provision of landscape is able to form a connection in some part of the area).
2 – Poor	(The provision of landscape is unable to encourage walkable environment in most of the study area. The maintenance of landscape is unable to provide the visual aesthetic value to the area. The provision of landscape is unable to form a connection in most of the area).

Cont..

1 – Very poor	(The provision of landscape cannot encourage walkable environment in the study area. The maintenance of landscape did not provide or enhances the visual aesthetic value to the area. The provision of landscape is unable to form a connection in whole study area).

Based on the inventory of green infrastructure element around Section 6, Section 7 and Section 8 in Shah Alam, in terms of the landscape provision it can be described that the level of provision in all three neighbourhoods are satisfactory although landscape provision in Section 7 is better in terms of its maintenance and provision. While Section 8 has the lowest level of landscape provision compared with other two sections. Therefore, it can be seen that people tend to walk within Section 7 and Section 6 compared to Section 8 as Section 8 has much lesser landscape and lack of maintenance.

Pedestrian walkway

Pedestrian walkway is an important element in a built environment especially in urban area in order to encourage more walkable environment and reduce the dependency of private vehicle. The provision of pedestrian walkway is one of the initiatives to reduce the traffic movement on the road which becomes one of the objectives for a liveable city. In this study, the linkage of landscape has been closely related with the linkage or network for pedestrian in order to identify the potential link component for green infrastructure network.

Table 3: Provision Level of Pedestrian Walkway Around Section 6, Section 7 and Section 8 in Shah Alam

Aspects	Section 6					Section 7					Section 8				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Provision				■				■				■			
Maintenance			■						■			■			
Connectivity			■					■			■				

5 – Very good	(The provision of pedestrian is adequate enough to encourage walkable environment in all or most of the area. The maintenance of pedestrian walkway is in a very good level which is able to enhance the visual aesthetic of the area besides being able to form a connection of network).

Cont..

4 – Good	(The provision of pedestrian is able to encourage walkable environment in most of the area. The maintenance of pedestrian walkway is good which is able to provide the visual aesthetic to the area besides being able to form a pedestrian network to most of the area).
3 – Satisfactory	(The provision of pedestrian is satisfactorily enough to encourage walkable environment in some part of the area. The maintenance of pedestrian walkway is satisfactorily less likely to provide the visual aesthetic to the area plus is unable to form a pedestrian network to the study area).
2 – Poor	(The provision of pedestrian walkway is unable to reduce the dependency of private vehicle within the study area. The maintenance of pedestrian walkway cannot provide visual aesthetic value to the area. The provision of pedestrian walkway is unable to form a connection in most of the study area).
1 – Very poor	(The provision of pedestrian is unable to encourage walkable environment in most of the area. The maintenance of pedestrian walkway is very poor which is unable to provide the visual aesthetic to the area besides failing to form a pedestrian network to the overall study area).

In terms of the pedestrian walkway provision in all three study areas, it can be concluded that the pedestrian walkway provided was adequate in both Section 6 and Section 7 compared to Section 8. It can be seen that both Section 6 and Section 7 generate more pedestrian movement as these areas are well connected and linked satisfactorily by the pedestrian walkway. While for the maintenance of the pedestrian walkway, based on the observation that has been made, it can be said that the maintenance level of pedestrian around these study areas is satisfactory where not all part of the areas are provided with proper pedestrian walkway which indirectly influence the connectivity between area through pedestrian walkways.
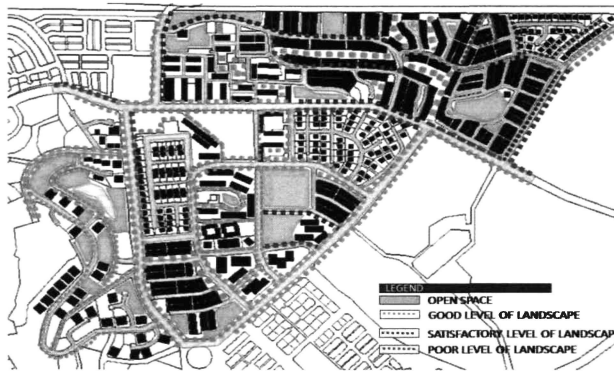
Figure 2: Green Infrastructure Components in Section 6, Section 7 and Section 8 in Shah Alam

CONCLUSION

Every state and local government has a park management plan. At the same time, local communities also have detailed plans for improving the facilities and infrastructure for the neighbourhood park. Green infrastructure plans provide a blueprint for sustainable management plans and create a framework for future growth and at the same time ensure significant natural resources will be preserved for future generations. Green infrastructure can provide many social, economic and environmental benefits close to where people live and work including space and habitat for wildlife with access to nature for people and improved health and well being of people as well as places for outdoor relaxation and play. Green infrastructure also acts as a catalyst to economic growth by attracting investment from businesses and tourists. It also saves environmental cost by improved air quality, reduces the urban heat island effect, filters diffuse pollution and helps to manage flood risk.

REFERENCES

Benedict. M, et al (2009). Green Infrastructure: Smart Conservation for the 21st Century. Sprawl watches clearinghouse monograph series, Island Press UK. Retrieved 6 October 2013, from *www.dnr.mo.gov/env/wpp/ stormwater/documents/gi.../gi-appendixb.pdf*

Suzuki, D. & Moola, F. (2010). Using smart growth to combat urban sprawl in Canda. Retrieved 6 October 2013, from http://www.straight.com/ news/david-suzuki-using-smart-growth-combat-urban-sprawl-canada

Tzoulas, K. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review, Landscape and Urban Planning, Volume 81, Issue 3, 20 June 207.

Weber et. al. (2011). Landscape and Urban Planning, Volume 96, Issue 4, 30 June 2012.

Williamson. K.S (2003). Growing with Green Infrastructure, GI, Heritage Conservancy, Doylestown PA. Retrieved 6 October 2013, from,*www. greeninfrastructurenw.co.uk/resources/Growing_with_GI.pdf*.

Winchester City Council (2010). Green Infrastructure Study 2010, Winchester City Council Wesite. Retrieved 6 October 2012, from http:// www.winchester.gov.uk/planning-policy/evidence-base/environment/ green-infrastructure-study-2010/