SUSTAINABLE URBAN GREEN SPACE AS URBAN ECOLOGY
Case Study: Urban Parks in Medan

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Abstract – Medan is lacking green spaces. By simply creating "greenery" out of flower beds, planted grass surfaces and trees does not necessarily lead to a more sustainable environment. In fact, conventional greening can be wholly unsustainable in its design. Without considering the local climate, the planting of appropriate plants, the provisions of playing fields, parks and sod strips along the boulevard can only add to aesthetic aspects, but the demand for water, fertilizer and maintenance has an adverse effect on the habitat of the area. Nevertheless urban ecology strives to create, preserve and restore green and open spaces *sustainability*. It also provides many environmental benefits: it reduces the urban heat island effect, minimizes the usage of pesticides, conserves energy, cleans urban air, and absorbs carbon dioxide from the atmosphere. Creating sustainable urban green spaces as urban ecology may begin with parks; as they offer a lot of ways to reduce the environmental impact in the city. The objective of this paper is to identify the trees characteristic at urban parks in Medan which fulfill the criterion of sustainable urban green spaces that may be a positive contribution for urban ecology.

Keyword: sustainable urban green space, urban ecology, park.

I. INTRODUCTION

The concept of sustainability has in recent years become an important paradigm in urban planning, ever since a high proportion of the world's production, consumption and waste generation are

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concentrated in cities. Subsequently, a general concern about quality of life and sustainability, with a particular focus on the city, has emerged on a world-wide scale. Our urbanized societies have increasingly become concerned with the built or man-made environment and with protecting or shaping nature in urban areas, and this has led to both specific man-made landscape patterns in the countryside and the creation of parks and gardens in urban areas (MacHarg, 1971).

II. URBAN GREEN SPACE AS URBAN ECOLOGY

Urban green spaces are a nice example of positive environmental externalities and play a key role in improving the liveability of our towns and cities. The quality and viability of cities largely depend on the design, management and maintenance of urban green as well as on open and public spaces with a view to their social, ecological and visual functions. The quality of green spaces helps to enhance the identity of towns and cities, which can improve their attractiveness for living, working, investment and tourism. Therefore, urban green can positively contribute to the competitiveness of cities.

Likewise urban green spaces provide many contributions to social and economic life, and to the ecological and planning system, and as a whole to the urban quality of life. Many previous studies have highlighted the contributions of urban green spaces from several perspectives including social, economic, ecological or planning dimensions.

From a *social perspective***,** appropriate types of green space can offer a greater diversity of land uses and opportunities for a wide range of activities. It can also help to foster active urban lifestyles, and can be of real benefit to social health. Urban green spaces can provide a safe play space for children (Jacobs, 1961) as well as contributing to children's physical, mental and social development (Hart, 1997). Thus it has a significant role in the basic education of schoolchildren with regard to the environment and nature.

From a *planning perspective***,** a network of high quality green spaces linking residential areas with business, retail and leisure developments can help to improve the accessibility and attractiveness of local facilities and employment centers. Well-designed networks of green spaces help to encourage people to travel safely on foot or by

bicycle for recreation or commuting (Scottish Executive, 2001). Consequently, well-designed urban green spaces provide a barrier to noise and can function as a visual screen for avoiding too much spatial uniformity (Dole, 1989, cited in Haughton and Hunter, 1994).

From an *economic perspective,* a green space might deliver products such as wood or fruits and also compost and energy as a result of urban green production. Their presence may create an increase in the economic value of an area and provide new jobs.

From an *ecological perspective,* urban green spaces moderate the impact of human activities for example, absorbing pollutants and releasing oxygen (Hough, 1984, cited in Haughton and Hunter, 1994). It also help to contribute to the maintenance of a healthy urban environment by providing clean air, water and soil (De Groot, 1994): improve the urban climate and as well as maintaining the balance of the city's natural urban environment (Stanners and Bourdeau, 1995). They preserved the local natural and cultural heritage by providing a habitat for a diversity of urban wildlife and conserve a diversity of urban resources. Conventional greening can be wholly unsustainable in its design. Without considering the local climate, the planting of appropriate plants, the provisions of playing fields, parks and sod strips along the boulevard can only add to aesthetic aspects, but the demand for water, fertilizer and maintenance has an adverse effect on the habitat of the area.

In conclusion, urban green spaces provide an added value to the urban environment, by enhancing its diversity and offering many socio-economic opportunities. Creating sustainable urban green spaces as urban ecology may begin with parks; as they offer a lot of ways to reduce the environmental impact in the city.

III. THE FUNCTION OF TREES IN THE URBAN ECOLOGY

Trees have various functions on the urban ecology. Generally, cultivation of trees will be able to eliminate the environmental problem such as air pollution and can function to reduce the micro climate temperature. Trees give the positive contribution on the urban ecology such as:

1. **Micro Climate Protection**
   Climate in the downtown usually exceed higher temperature than in the sub-urban. Cultivation of trees enables to reduce micro climate temperature and give shade to the urban areas. Trees help to give protection from rain, sunshine and wind.
2. **Reducing Environmental Pollutants** Through the photosynthesis process, trees can permeate pollutants at various amounts, according to its type. This natural process will be able to reduce the pollutants accumulation (such as carbon dioxide) in the downtown.
3. **Improve the Quality of Urban Ecology and Wildlife**
   Trees will guarantee availability of oxygen at the urban environment. Through photosynthesis process, trees will alter pollutants to become oxygen. Cultivating trees by using natural ways will eliminate dependence on chemical fertilizer. Some types of trees draw wildlife especially small animals such as birds or the like; these will help to stabilize the urban ecology system.

IV. A BRIEF OUTLINE OF GREEN SPACE IN MEDAN

Geographically, Medan is located between 2°. 27 - 2°. 47' Parallel North and 98°.35 - 98°.44' Longitude East and resides at the height 2, 5 - 37, 5 meters above sea level (Figure 1.0). The area of Medan region is about 26.510 hectare. The city of Medan has total inhabitants of 2 million people, with a density of 2.328 people per hectare. However the total area of urban space which functions as 'urban green space' is about 744, 67 hectare, it is only about 2.8% from the total area of town centre. The proportion of the green space with respect to the total area of the city is rather small as compared to WHO standard. According to WHO, the production of oxygen in the urban area requires about 20 - 30% of green space from the total urban area of about 10 square meters per people.

Generally, the urban green spaces in Medan spread all over in the downtown especially the north quarter and south quarter of the downtown. In the north and south quarter, the urban green spaces are dominated by mangrove forest, riverside vegetations and the zoological parks (Figure 2.0). However, the urban green spaces at the downtown

are dominated by playing fields, boulevard along the sod strips and public parks. Additionally there are three public parks in the downtown. It has a square shape: namely *Lapangan Merdeka*, *Lapangan Benteng*, and *Ahmad Yani*. These parks are selected as a case study with consideration that all of these parks have fulfill the criterion as urban public parks in the city of Medan.

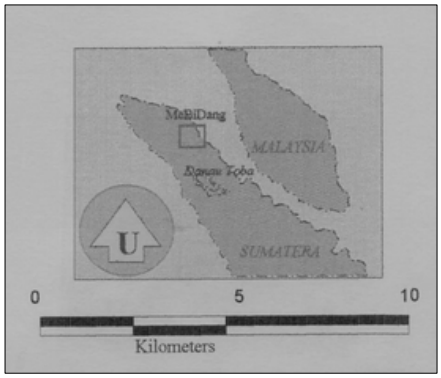

Figure 1:
Geographical Location of the city of Medan

Figure 2:
Medan and its vicinity

Medan downtown was formed and developed by the Dutch government at the end of 19th century, which is almost an ending period of the colonial era in Indonesia. Medan was designed as *new colonial urban settlement*. Although the European population was small but they dominate the Polonia area. The Dutch laid down their government district in the downtown, with *Lapangan Merdeka* Park as a square. During the colonial era the European assumed to have the highest social status because they dominated the government departments. Polonia area was designed with garden city concept. The green space of the inner city comprises of *Lapangan Benteng* and *Ahmad Yani* and serves as an urban amenity which huddles up all requirements of their needs according to their life style.

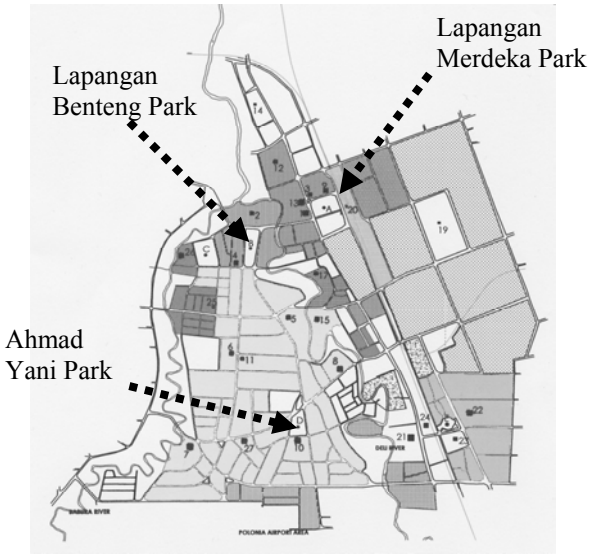

Figure 3: Downtown area, which developed by Dutch.

Figure 4: Satellite image of *Lapangan Merdeka* Park

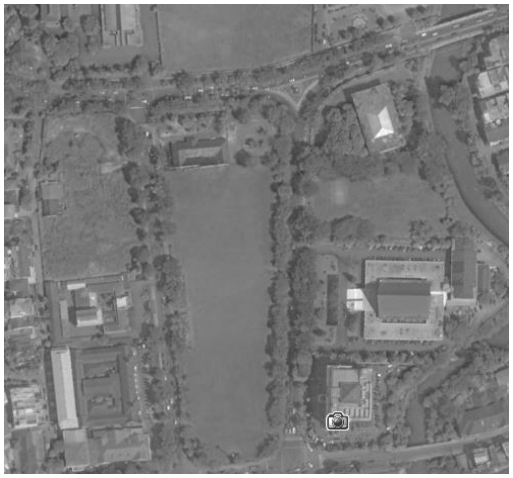

Figure 5: Satellite image of *Lapangan Benteng* Park

Figure 6: Satellite image of *Ahmad Yani* Park

V. URBAN PARKS IN MEDAN

This study was conducted by identifying the type of trees that exist in each public park and identifying its characteristic and relationship with the condition of the environmental ecology.

1. *Lapangan Merdeka* Park.

The area of this park is about 53,392.10 square meters; *Lapangan Merdeka* Park has a square shape. Hence the park has been used as an official function. The surface of the park is covered with grass and surrounded by rows of trees. The Dutch government planted the *Samanea saman* trees around the park as a focal point, and until today they are still in good conditions. The identification of the trees is illustrated in Table 1.

Table 1:
Trees identification at *Lapangan Merdeka* Park.

Name of Trees	Origin		Maintenance			Characteristic		
	Tropical tree	Non-Tropical tree	Requires a lot of water	Prefers full sun	Requires a lot of fertilizer	Attracts Birds	Attracts Butterfly	Way side tree/palm
Samanea saman (Ki hujan)	*			*		*		*
Swietenia macrophylla (Mahogany)	*			*		*		*
Filicium decipiens	*		*	*				*
Tamarindus indica (Asam Jawa)	*		*	*		*		*
Roystonea oleracea (Palem raja)	*		*	*				*

2. *Lapangan Benteng* Park.

The function of this park is exploited by the military activities especially during the formal military parade and sports events. The area

of this park is 25,202.30 square meters. The surface of the park is also covered with grass and surrounded by ornamental trees as in Table 2.

Table 2:
Trees identification at *Lapangan Benteng* Park.

Name of Trees	Origin		Maintenance			Characteristic		
	Tropical tree	Non-Tropical tree	Requires a lot of water	Prefers full sun	Requires a lot of fertilizer	Attracts Birds	Attracts Butterfly	Way side tree/palm
Bauhinia Purpurea (Butterfly tree)	*			*		*		
Swietenia macrophylla (Mahogany)	*			*		*		*
Artocarpus heterophyllus (Nangka)	*		*	*				
Filicium decipiens	*		*	*				*
Tamarindus indica (Asam Jawa)	*		*	*		*		*

3. *Ahmad Yani* Park.

The area of this Park is about 19,110.20 square meters. The Dutch government designed this park as a central park in order to serve the housing estate at the *Polonia* area. This park has various types of ornamental trees. During the colonia era the park served the function of the inhabitants for the recreational purposes. The type of trees also plays a significant role as illustrated in the Table 3.

Table 3:
Trees identification at *Ahmad Yani* Park.

Name of Trees	Origin		Maintenance			Characteristic		
	Tropical tree	Non-Tropical tree	Requires a lot of water	Prefers full sun	Requires a lot of fertilizer	Attracts Birds	Attracts Butterfly	Way side tree/palm
Delonix regia (Flamboyan)	*		*	*		*		
Swietenia macrophylla (Mahogany)	*			*		*		*
Alstonia scholaris (Pulai)	*		*	*		*		*
Artocarpus altilis (Sukun)	*		*	*				
Artocarpus heterophyllus (Nangka)	*		*	*		*		
Filicium decipiens	*		*	*				*
Manilkara zapota (Sawo)	*		*	*		*		
Plumeria obsuta (BungaKamboja)	*		*	*		*		*
Cocos nucifera (coconut)	*		*	*		*		*

Roystonea oleracea (Palem raja)	*		*	*				*

VI. CONCLUSIONS

The above examples of the public parks in the city of Medan are mainly dominated by trees, shrubs and grass. It fulfilled the requirement of an open space according to the Dutch. Hence, it is quite a common feature of public parks at that time comparing to its cousin in Europe such as Hyde Park or Marseilles or the like. The parks do not only serve as an open space or the "lung" in the city centre but it became a recreational and cheap family entertainment area since then. It also served as a playground in the neighborhood as well as a military marching exercise.

The geographical advantage of the city of Medan whish is bestowed with abundant rainfall and sunshine all year round encourages the sustenance of the park with minimal maintenance. The tropical trees require abundant rainfall and sunshine minus the fertilizer where the thick undergrowth helps to sustain water and provide natural compost for the tree to live healthily.

Some trees such as *Delonix regia, Macrophylla Swietenia, Alstonia Scholaris, Artocarpus Heteophyllus, Manilkara Zapota and of Tamarindus indica* can attract birds and other wildlife which can be a scenic sight of the urban areas. Thus the existences of trees have fulfilled the criterion for sustainable urban green space and give the positive contribution for the urban ecology.

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