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PROPOSED DEVELOPMENT OF ECO-PARK AT UNIVERSITI PUTRA MALAYSIA (UPM)

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ABSTRACT

The following project paper puts forward a proposal for an Eco-Park in *Universiti Putra Malaysia (UPM)*, a higher educational institute located in the state of Selangor in Malaysia. The proposed site has a strategic location because of its proximity to the highway, a commuting line and is situated near to a major city (i.e. Kuala Lumpur). The natural features present are namely a lake, a stretch of river and a secondary forest. The potential social benefit from the development of the Eco-Park is that it can serve as a recreational space that is easily accessible by residents, students and the general public. Meanwhile, the environmental benefits of the Eco-Park are that it will serve as a governed space for the preservation of the natural features (i.e. vegetation and water bodies), which will potentially improve the ecosystem services in the proposed location. An added benefit of the park is that it can promote a scenic view for the public commuting through the area. Presently, a Metro Transit Line (MRT) is in construction next to the proposed site; thus, source of funding can be channelled by the MRT developer as a means to strike a balance for clearing of the area.

Keywords: *Nature; Recreation; Urban Park; Neighbourhood Park; Natural Features*

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PROJECT INTRODUCTION

As cities make way for more built structures, natural features often take a backseat in urban planning. Natural areas situated close or within urban areas are prized possessions because they have high ecological value, serve as a passive recreational space, has environmental-educational potential and is viewed as a natural heritage (Jim, 2004). Urban ecological infrastructures that now replace these natural areas have emerged in the last three decades as the leading supporter of ecosystem services for the urban environment, which has significantly improved the quality of life of city-dwellers (Breuste *et al.*, 2015).

The ecological infrastructures such as green spaces, as highlighted by Jim, 2004 should maintain its original structure, associations and constituents as much as possible. Urban green spaces play an essential role in satisfying the recreational demands of citizens in tandem with the preservation of diverse natural resources which safeguards the ecological resilience and adaptability of the ever-changing urban ecosystem, (Zheng *et al.*, 2019). The "Ecological Park" (or Eco-Park) emerged by adopting the concept of building a space for the ecological resilience of a city. An Eco-Park is a large, connected landscape that possesses high nature conservation and environmental protection value (Reefat, 2014).

Table 1: Principles of Sustainable Landscape Design (Jamaludin *et al.*, 2014)

PRINCIPLES OF SUSTAINABLE LANDSCAPE DESIGN	Sustainable Sites and Management	Conserve and protect natural site
		Maintain natural form of topography
		Sufficient greenery to counter urban heat island effect
		Storm water management
		Pollution control
	Energy Efficiency	Use renewable energy
		Use fluorescent light or natural light
		Transportation ease
	Water Efficiency	Conserve water system
		Rainwater harvesting
		Water recycling
		Water efficient landscape
	Materials-Hardscape and Softscape	Hardscape (Environmentally friendly materials: e.g. material reuse & regional materials)
Softscape (Maximize native and natural features, promote ecosystem services and low-maintenance)		

A study by Jamaludin *et al.*, 2014 identified several principles of sustainable landscape design for the application in recreational spaces like Eco-Parks; these principles are the guiding principles for practitioners in designing a sustainable landscape that is suitable for Malaysia's climate, condition and scenario (refer to table 1). Eco-Parks are not only vital for preservation, but also the restoration of nature conservation and large-scale transformations of urban landscapes" (Reefat, 2014). This project paper proposes an Eco-Park within an educational institute by using the site survey and analysis. Thus, the objective of this paper is:

- 1) To identify the suitability of the site as an Eco-Park based on its characteristics.
- 2) To formulate a Strength, Weakness, Opportunity and Threat analysis on the features of the site.
- 3) To design a proposed Eco-Park with a zoning plan for the site.

METHODOLOGY

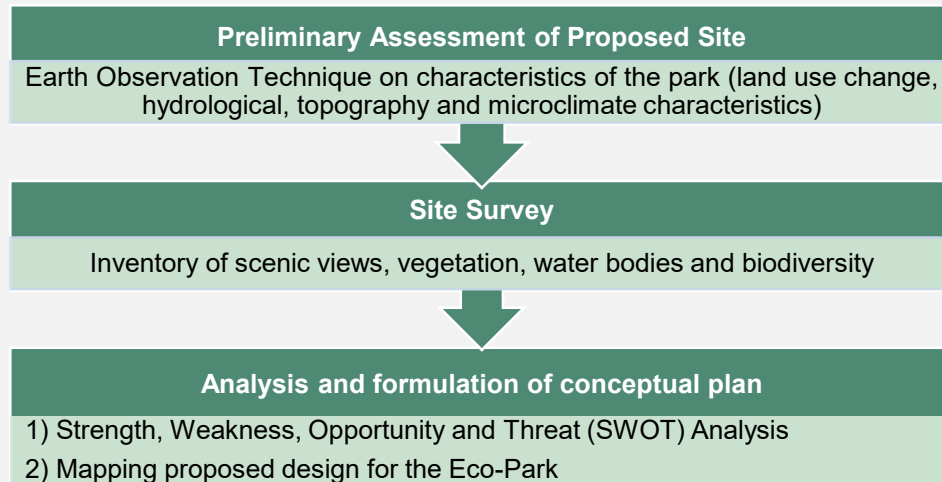


Figure 1: Flowchart of Project Paper

RESEARCH FINDINGS

This project paper presents findings on the characteristics of the proposed site.

1) LAND-USE CHARACTERISTIC OF PROPOSED SITE

UPM is located in the town of Serdang in the state of Selangor in Malaysia; it is connected to the North-South Highway, and the nearest railway station for public commuting is about 7 km from the area (Figure 2 & 3). The distance of the university with major cities and growth areas are such as Kuala Lumpur (27km); Putrajaya (14km); Cyberjaya (18km); Petaling Jaya (35km); Subang Jaya (27km); Shah Alam (43km) and Bangi (18km); this makes it a high-value property. The proposed site is adjacent to the Faculty of Forestry and Environment, Faculty of Food Science and Technology as well as Family, Adolescent and Child Research Centre of Excellence (FACE) in UPM. The proposed site also includes UPM International Residence, an MRT line (under construction) and Environmental Forensics Research Centre (iENFORCE) (Refer to map figure 6). It is also near to several commercial areas such as *Taman Sri Serdang* (Figure 4), IOI Shopping Mall and The Mines Shopping Mall. Other than the places mentioned, the proposed is also near several other recreational areas (Figure 5 and Map in Figure 7).



Figure 2: KTM Serdang (Public Commuting)



Figure 3: UPM MRT Station (Public Commuting)



Figure 4: *Taman Sri Serdang* (Commercial Area)



Figure 5: Sri Serdang Lake (Recreational Area)



Figure 6: Location Plan (not to scale)

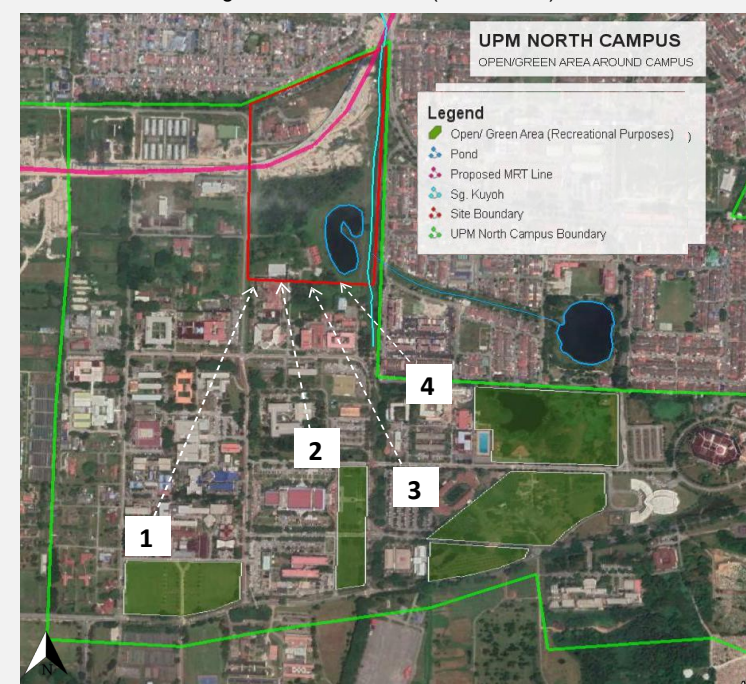


Figure 7: The existing recreational areas within UPM North Campus are concentrated at the southern part

Table 2: Land use changes in the proposed site in the year 2001, 2007 and 2019
 (Satellite Image of Google Earth Pro, 2020)

Land Use	2001	2007	2019	
Build-Up	0	Area: 20564.5 m ²	Area: 11785 m ²	
Green Area	Measure			
	Agriculture Area	Plot (1): 32,568m ² Plot (2): 8650m ²	Plot (1): Replaced by new build-up Plot (2): 8650m ²	Plot 1 and 2: Replaced by build-up Green Area (3): (Not agriculture)
	Measure	Formula: Total area – (1) – (2) = (3) Calculation: 159518 – 32568 – 8650 = 118,300 m ²	Formula: Total Area – (2) – Build up – Water bodies = (3) Calculation: 159518 – 8,650 – 20564.5 – 9,695 = 120,608.5 m ²	Formula: Total Area – Build up – Water Bodies – Construction site = Agriculture Area Calculation: 159518 – 11785 – 10,277 – 39080 – 98376 = 0 m ²
	% Green Area	Calculation: 118300/159518 X100 = 74.16%	Calculation: 120608.5/159518 x100 = 75.61%	Calculation: 98376/159518 x100= 61.67%
Change		Increase in green area size because UPM applied a mix-used development by integrating the new build-up with the green area	All the agriculture area converted to new build-up and construction area	
Water Bodies	Type	Kuyoh River (Sg. Kuyuh)	Kuyoh River = 580 m Lake = 9695 m² (Water condition is clear)	Kuyoh River = 580 m Pond = 10,277 m² (Water condition is clear)
Change		Due to the limitation of the data image, the exact location could not be identified and measured	Water Bodies Change: The increase in the size of the lake is because of the pond becoming shallow due to sedimentation from the surrounding development	
Construction Area	Measure	0	0	39,080 m ²

Table 3: Summary of Land Use Changes in 2001, 2007 and 2019

YEAR	LAND USE
2001	<ul style="list-style-type: none"> Green Area Water bodies (Kuyoh River)
2007	<ul style="list-style-type: none"> Build Up Green Area- Agriculture Water bodies (Kuyoh River and Lake)
2019	<ul style="list-style-type: none"> Build Up Green Area Water Bodies Construction Area

Table 4: Measure of Proposed Site

Measurements	Units
Perimeter	1,686 meters
Area	159,518 square meters



Figure 8: Land use Changes (2001)



Figure 9: Land use Changes (2007)



Figure 10: Land use Changes (2019)

The agriculture area increased from 74.16% to 75.61% in 2007 when the area was changed to mixed-use. In 2019, the green area was converted to build-up area, thus further reducing the green area to 61.67%. At the same time, the water body on the land had increased due to sedimentation

(Source for Figure 8, 9, 10: Satellite Image of Google Earth Pro, 2020)

2) HYDROLOGY OF PROPOSED SITE

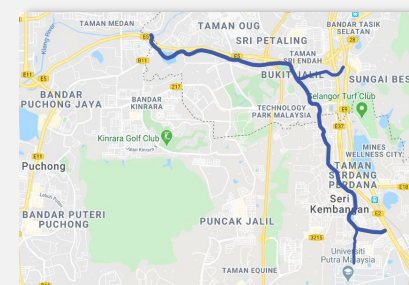


Figure 11: Kuyoh River sub-catchment is about 8.4 km in length



Figure 12: Map of Klang River Basin

Kuyoh River is one of the tributaries of Klang River (refer to figure 12). The river has been classified as a polluted river with water quality classification that of Class III to IV.



Figure 13: Hydrology Plan (not to scale)

The Kuyoh River flowed from upstream taking the collected water discharged from UPM and around *Taman Sri Serdang* as well as *Serdang Jaya areas* (refer to figure 13) which are also residential, commercial and industrial. The area activities had considerably contributed to the low water quality recorded. In 2018, the sediment collected in the lake turned yellow (Figure 14). The evidence thus shows the impact of the surrounding development and surface runoff on the lake.



Figure 14: Surface runoff towards the Lake

Table 5: Measurement of water bodies

WATER BODIES	MEASUREMENT
Kuyoh River	600.0 m length, 5.0 m wide
Lake	Parameter: 550.0 m, Area: 10.3 msq

3) TOPOGRAPHY CHARACTERISTIC OF PROPOSED SITE

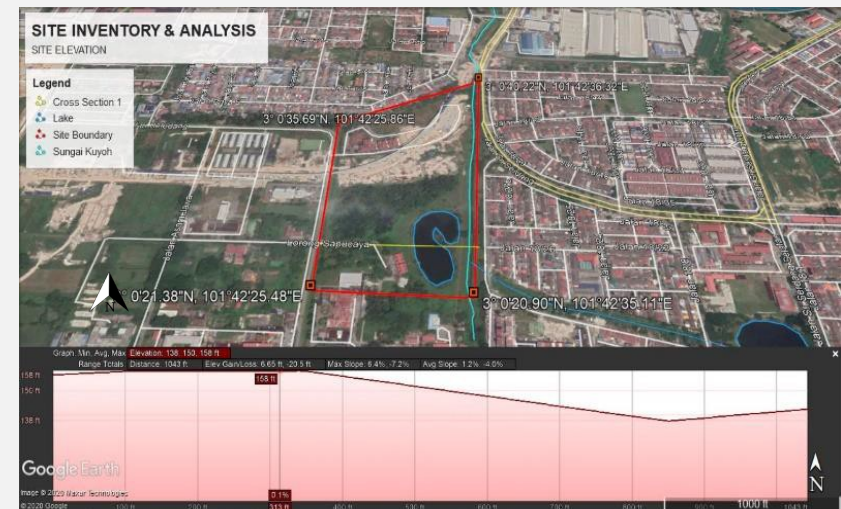


Figure 15: The site elevation for the lower part of the area

The western part of the lower area, the ground slope down to the lowest point at about 42.1 m (138 feet) and rose again at about 42.7 m (140 feet) (Figure 15).



Figure 16: The site elevation for the upper part of the area

The high ground on the west side of the upper area sloped steeply eastward, with the lowest point of 44.5m (146 feet) (Figure 16.)

4) MICROCLIMATE CHARACTERISTIC OF PROPOSED SITE

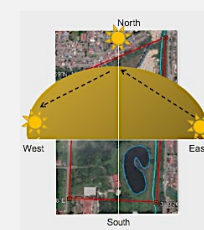


Figure 17: Solar Movement

The town of Seri Serdang has an equatorial climate where the surrounding season dictates the weather and the prevailing wind system with an average temperature of 27.0 °C and a high average rainfall of 2390 mm annually (Climate-Data, 2020). The rainfall in Seri Kembangan is significant. It has recorded precipitation even during the driest month of June and July annually. Figure 17 depicts the solar movement of the proposed site.

5) EXISTING WILDLIFE & VEGETATION OF PROPOSED SITE

The MRT construction project did not remove all the vegetation on the site. There is still more than 50% of the vegetation remain, and the wetland remains undisturbed. The vegetation consists of a variety of plants that are mostly wild (Figure 18) and among the wildlife identified at the proposed site is the stork bird (Figure 18).

6) SCENIC VIEWS CHARACTERISTIC OF PROPOSED SITE

One of the essential element in planning an Eco-Park is to maintain and protect the scenic views of the area. Visitors are usually drawn to visually appealing features. Among the scenic views identified in the proposed site are as follows (Figure 18):

- The mirror lake
- A lush green vegetation with a bright blue sky
- A small stream running next to the green walkway

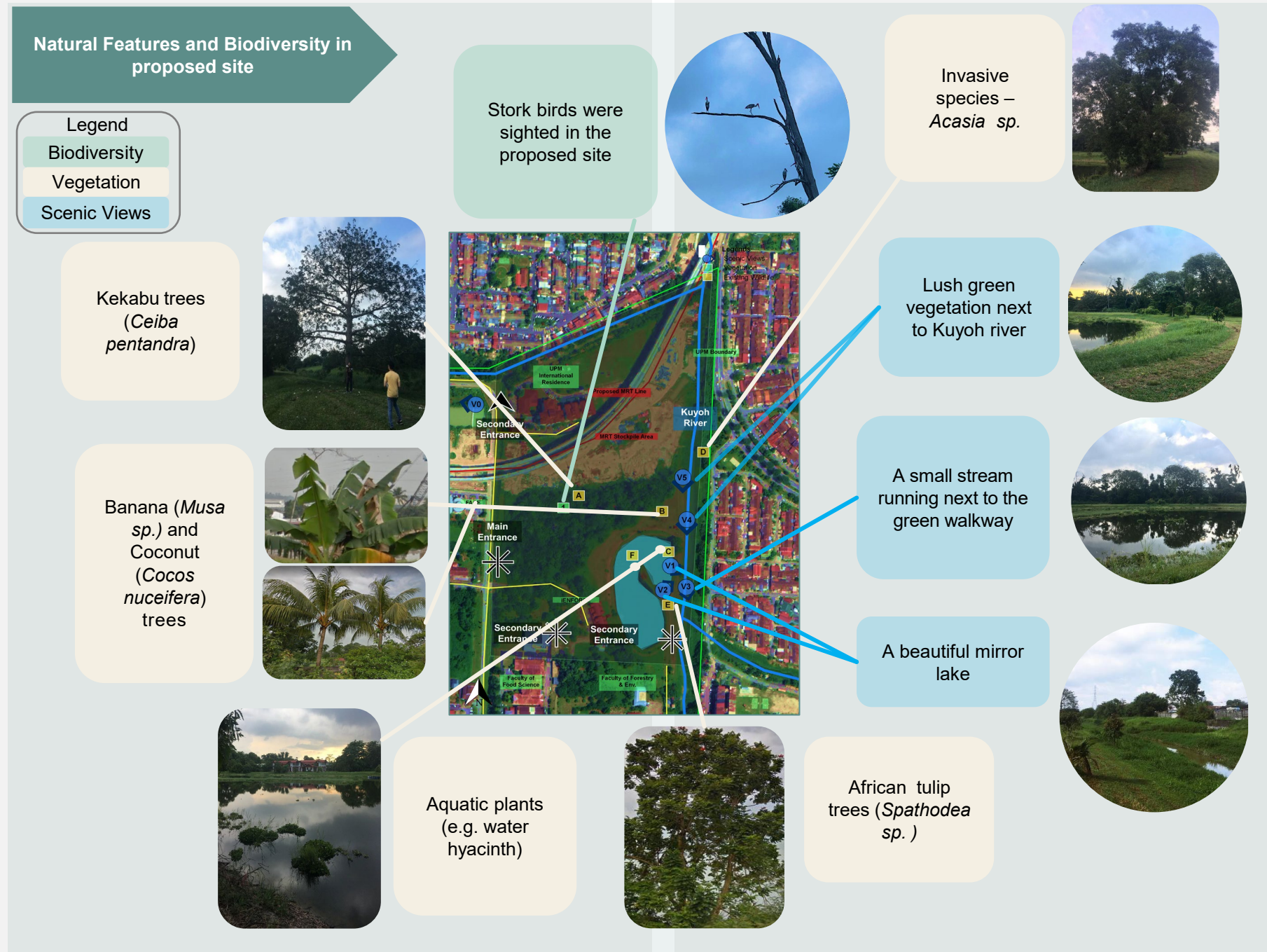


Figure 18: Wildlife, Vegetation and Scenic Views in the proposed site

7) PROPOSED DESIGN ECO-PARK

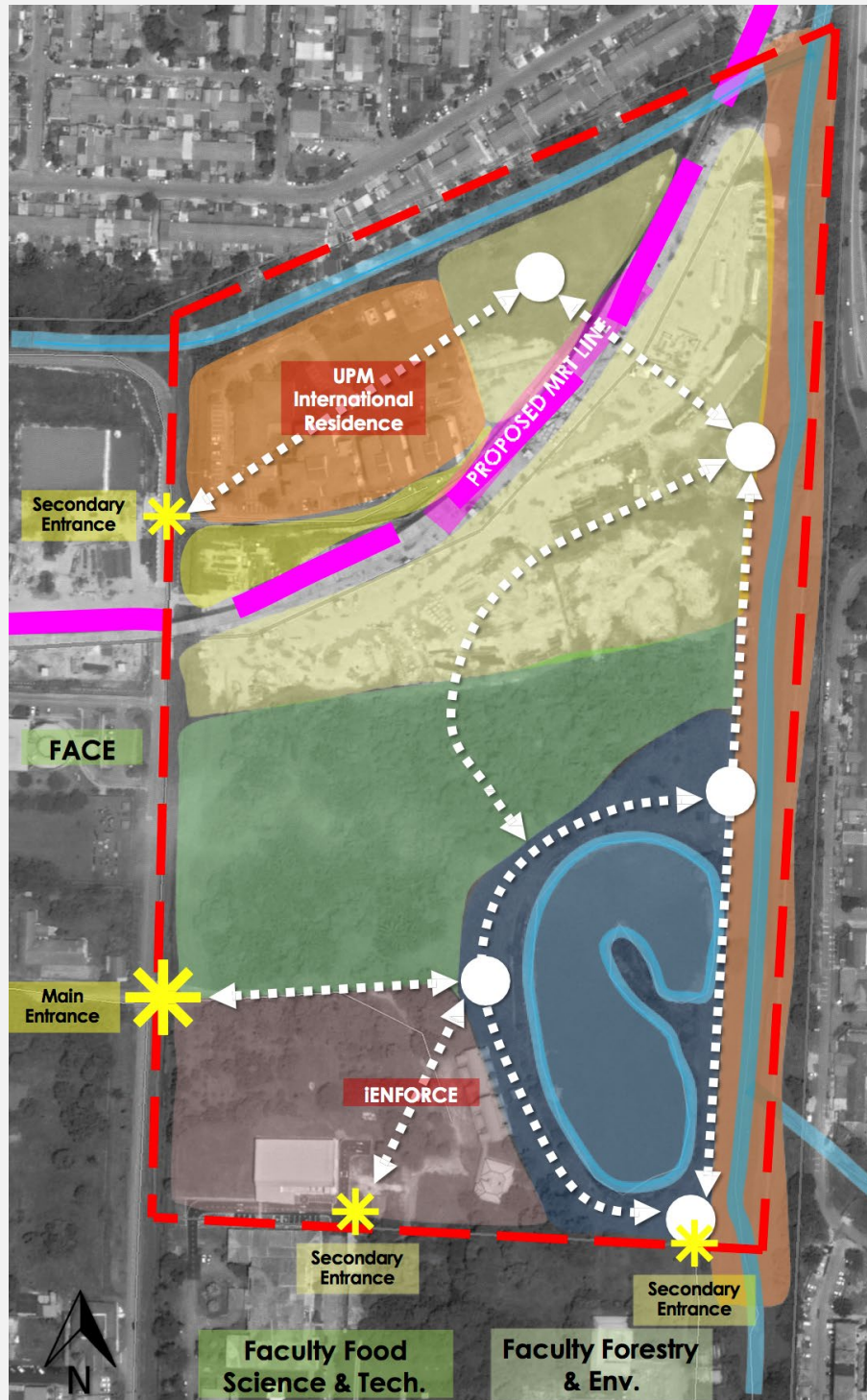


Figure 19: Proposed Zoning Plan (not to scale)



Category: Neighbourhood Park (JPBD, 2010)

Classification of open spaces for recreational purposes:

1. Size/area: 2 ha
2. Population catchment: 3,000-12,000 individuals
3. Types of open spaces: recreation, sport & nature

Table 6: Legend for Proposed Zoning Plan Map

ICON	Description
	Circulation
	Nodes (centre for activities + facilities)
	Kuyoh river/ drainage
	Residential zone - Access to buffer zone
	Buffer zone - Trees replanting (ex situ experimental plot) - In-situ learning spot (brown area) - Buffer to MRT line
	Conservation zone - Planting enrichments (native plants) - In-situ learning spot (flora & fauna) - Scenic views
	Recreation zone - Active activities - Flood control - In-situ learning spot (Aquatic/lake) - Scenic views
	Riparian zone - Flood control - In-situ learning spot (aquatic/riparian/river)

The zoning plan aims at leveraging the characteristics of the proposed site. The buffer zone suggests replanting of vegetation and the conservation zone with the water body is dedicated as a space for native plants. The recreation zone is sandwiched between the buffer and conservation zone to provide park users with the view of green to blue features. Meanwhile, the riparian zone will serve as a buffer during the monsoon season, to prevent flooding.

7) SIGNIFICANCE AND SWOT ANALYSIS OF ECO PARK

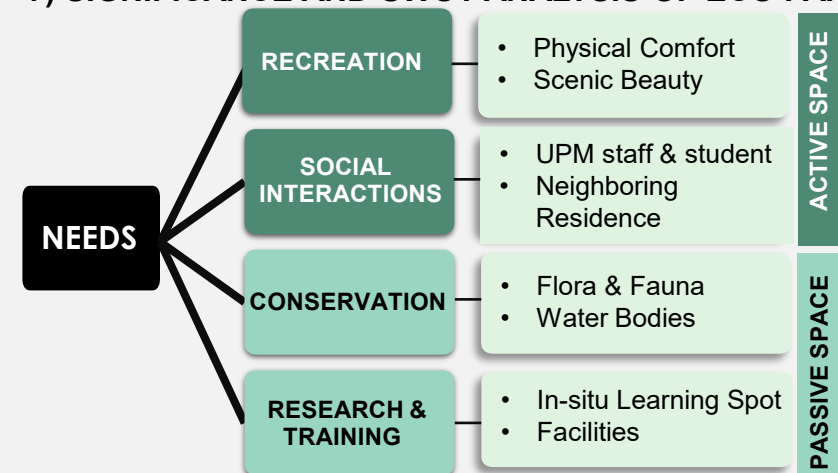


Figure 20: Significance of the Proposed Site as a passive and active space

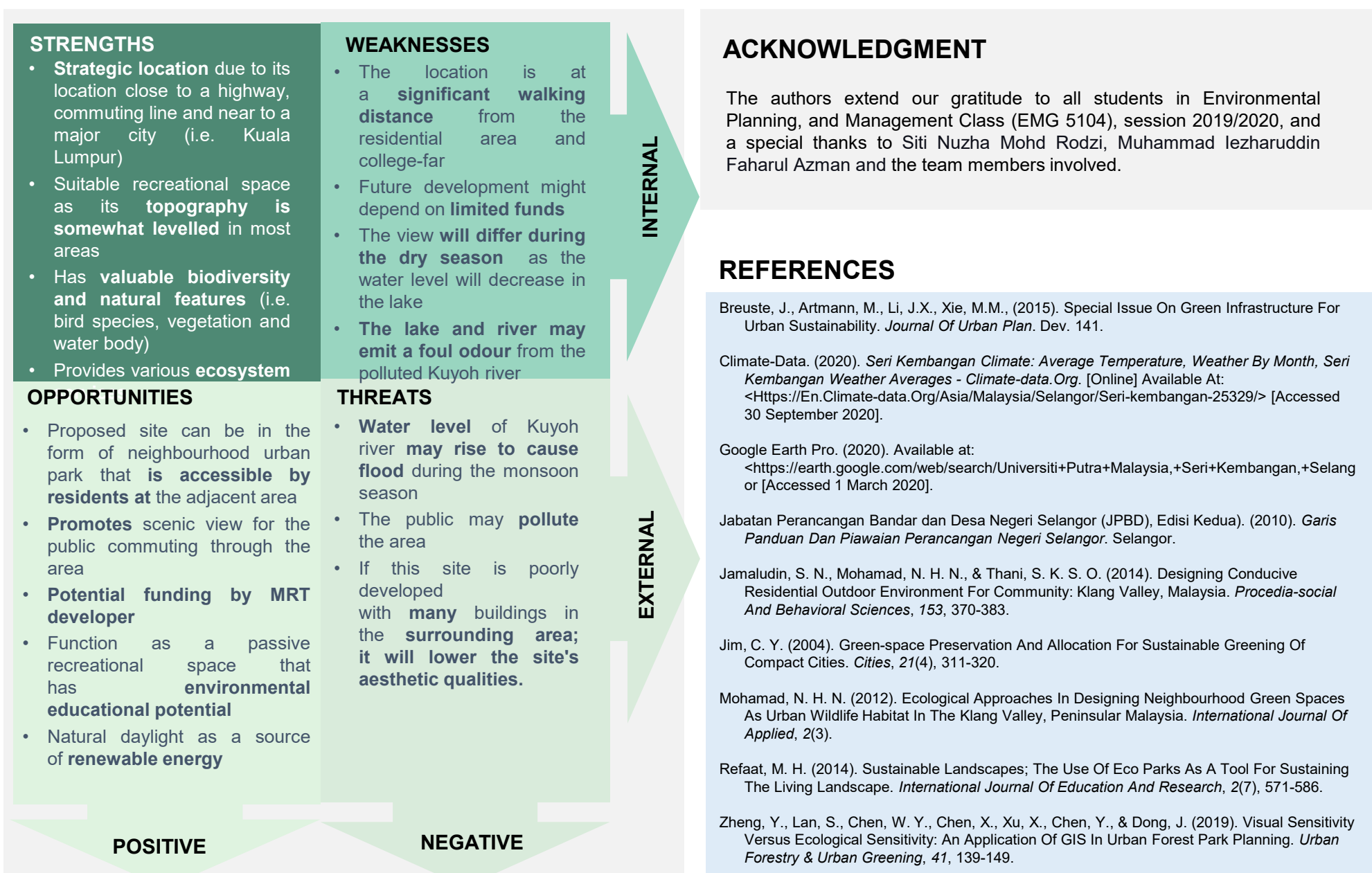


Figure 21: SWOT Analysis of proposed site as an Eco-Park

CONCLUSION

Eco-Park can serve as a governed space to preserve natural features where it provides authentic opportunities for learning. The proposed site is located in an educational institute where it is adjacent to faculties and research centres with spaces that can offer students and researchers with a hands-on learning experience. The findings from this project paper demonstrate that the characteristics of the park have proven to be a suitable space for an Eco-Park, with a rich diversity in vegetation that can provide a plethora of ecosystem services. The water bodies within the space can also serve a variety of functions, e.g. stormwater management or for aesthetic purpose. The vegetation onsite provides an opportunity to combat the urban heat island effect. The potential Eco-Park developers can maintain the natural topography of the site as it is naturally levelled which thus, provide the space with a rich opportunity to apply sustainable landscape design principles. The zoning proposed design for the Eco-Park aims to leverage on the features within the space to maximise its functionality.

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