

Protection of Natural Wetland within Development Area: A Case Study of Tasik Melati

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Abstract: - Wetlands provide an important ecological function that contributes to watershed functions, most notably in pollutant removal, flood attenuation, groundwater recharge and discharge, shoreline protection, and wildlife habitat. However, despite of the many watershed services wetlands provide, the pressure from the development of a city is great. This research is carried out to identify the threats that will affect wetlands and the surrounding area undergoing development by using several methodologies, namely observations, photograph analysis and interviews. The area chosen for the study is a wetland in Tasik Melati near the township of Kangar Perlis which is located in the Northern Peninsular Malaysia. The area was originally fresh swamp forest and in 2001 has been designated as recreational area. Currently 50.4 acres has been developed and another 33.3 acres is for future development. This event more or less provides an attestation to the function and the role of this wetland and the impacts that may occur if it were to undergo any changes. There is a need to compromise between conservation and development as conservation of wetlands is of great significance in preventing flooding.

Keywords-wetland, conservation, development, wildlife habitat, watershed

I. INTRODUCTION

Wetlands provide many functions and also services within the local watershed, yet the benefits of wetlands are seldom appreciated by the growing communities. Wetlands can improve quality by removing pollutants, minimizing the flood damage by slowing and storing floodwaters, and protecting shorelines from erosion by absorbing storm surges. Moreover wetlands also supply habitat for birds and wildlife and create recreational opportunities. However many wetlands have become degraded due to improper attitude and ignorance of the public. Despite the hundred lessons that should have been learnt across the world, people are still slow in learning the importance of the wetlands and their long-term value. The principle of sustainable development of these wetlands is crucial and essential.

II. INTRODUCTION

Public and political awareness of wetland values continues to increase, but sectoral organization and responsibilities for wetland management is still lagging behind. Underlying causes includes a lack of understanding of wetland hydrology and ecology by stakeholders and poor coordination of the many different agencies responsible for wetland management. No specific guidance exists for managing wetlands in the context of local watershed plans, and local governments usually have insufficient knowledge and tools to effectively protect especially wetlands within the area of development. Wetlands should not be managed separately from other water resources because they are an integral part of water resource management.

III. GOAL AND OBJECTIVES

The aim of this paper is to acknowledge the importance of wetlands protection in current development scenarios especially in the urban area.

The objectives are as follows:

- i) To identify the current and potential threats that will affect the natural wetlands in current development areas;
- ii) To identify the effectiveness of conservation and protection practices in the natural wetlands within the development area; and
- iii) To propose effective construction and design methods for urban wetlands.

IV. METHODOLOGY

The methodology for this study comprises several stages that are observation and data collection, photograph analysis, interviews and data analysis.

4.1 Observations

During site visits observation of the study area was carried out and information was jotted down.

4.2 Photograph analysis

In order to aid the researcher, a digital camera was used to take photographs of the surrounding environment during the site visits. The photographs are used for data analysis.

4.3 Interviews

An unstructured interview was carried out with local people who were deemed to be able to answer the critical questions that cannot be obtained by observations. The information obtained was the cross check the expert..

V. STUDY AREA

Tasik Melati is originally a freshwater swamp and also known 'Paya Kercit' because this area is full of plants name 'Kercit'. It is located at Jalan Santan 10 kilometers away from Kangar the capital of Perlis. Perlis is located in the Northern part of Peninsular Malaysia and is the "rice bowl" of Malaysia area. Depending on the season, it is surrounded by lush green fields or golden yellow paddy.

Tasik Melati consists of two main lakes and several sub-lakes. The biggest one is the existing lake while the other lakes are man-made. The depths of two main lakes are about 2 metres, while the others are shallow areas. The site is a flat area. The area consists of natural swamp forest which is able to absorb and retain water. The forest comprises an ancient and unique ecosystem characterized by waterlogging.

Department of Irrigation and Drainage, Kangar, Perlis begins to develop the area in 1977. They have created bunds to increase the water level, for the purpose of irrigating 350 acres of paddy fields nearby. This lake is the main source for paddy irrigation in the 1970s however it is no longer used for paddy irrigation.

In 1985, when the government realized the potential of the site as tourist attraction by providing facilities for the public use. In 2001, the area officially put under the management of Department of Irrigation and Drainage. Currently this 80 acres area is gazetted as recreation area. The area is equipped with facilities such as gazebo, playground, jogging trek, toilets, parking and man made landscape. This lake is the main recreation area for local people nearby.

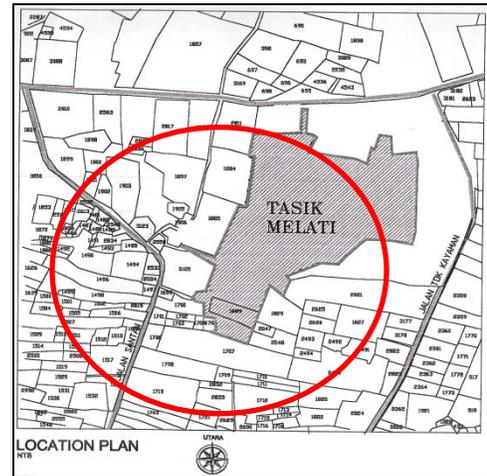


Fig 1 Location map of Tasik Melati
Source: JPS Perlis

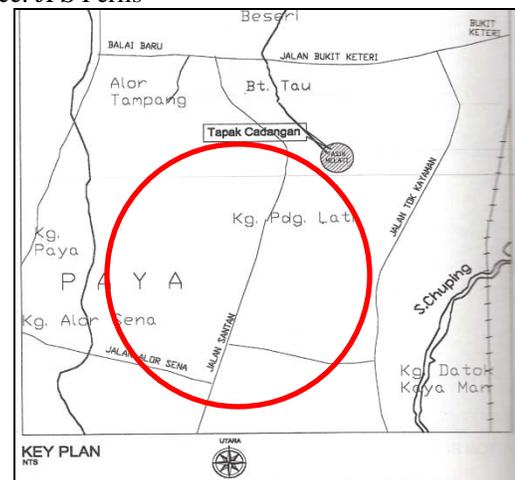


Fig .2 Key plan of Tasik Melati
Source: JPS Perlis

VI. DATA ANALYSIS AND FINDINGS

6.1 Topography and drainage system

Tasik Melati is a natural freshwater wetland where the main water sources for the lakes come from the spring. The contributing drainage for the site is from the residential areas nearby. There are water discharge outlets for controlling water level. The water discharges will directly flow into the drain then to Sungai Repoh. This area has never been flooded. Furthermore, it also functions as retention pond for residential areas nearby. The site is surrounded with residential areas and paddy fields.

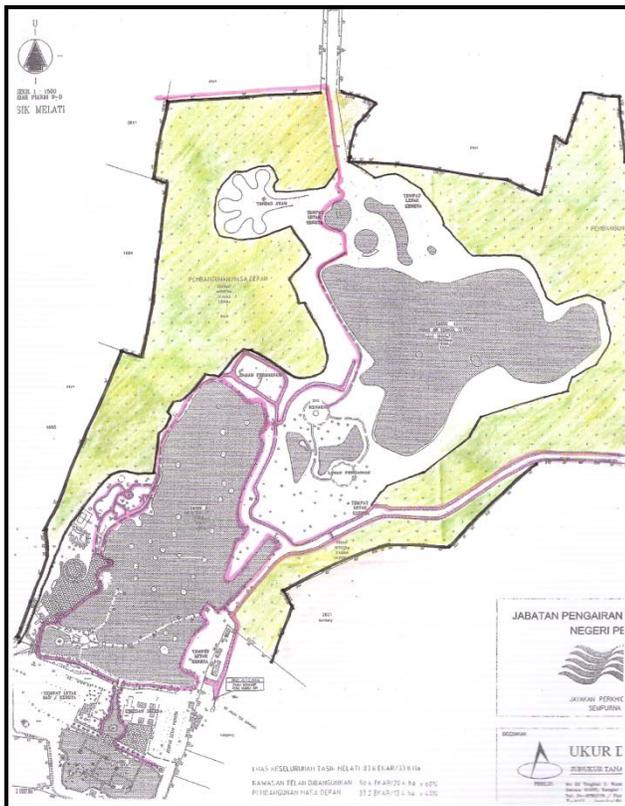


Fig 3 Drainage system of Tasik Melati
Source: JPS Perlis

6.2 Soil configuration

The soil types in the lake areas are clay soil mixed with sandy soil. The soils conditions are wet and water logged. Furthermore, the naturally high water level of the area helps to prevent the soil from drying out.

6.3 Flora and Fauna

There is no written record on the flora and fauna Tasik Melati. Information were obtained by researcher with the assistant of local people and the information was cross check with expert from University Malaya.

The characteristics of flora in Tasik Melati are variables from submerged plants to upland plants. Very distinct and unique characters of the area is *Alstonia spathulata* trees which provide identity to the area.. The trees are 6m height, diameter 10 cm, bark darkish grey with white latex. The habitat is in very marshy forest.

Other species are the emergent and submerged plants. Some of them are believed to be endemic to the area. These submerged plants are named Lumut Sutera and Lumut Ekor Kucing by local people. The submerged and emergent plant functions as pollutant removals that provide services in terms of nutrients cycle, sediment retention, runoff filtrations and organic matter transportation. They are also habitat for small fishes. While the other unique

features of the site is Periuk Kera. These plants are used by the local people to cure catarrh

The fauna that usually found in the areas are the mammals, reptiles, birds and amphibians and the migratory birds.. Squirrels, monkeys, lutong, phytons, merbuk and tekukur are generally found in the area. Types of water habitats are puyu, carps, cat fish, lampam, and most of them are introduced fish..

6.4 Sandbar Islands

A very distinct and unique character of the area are the flora and the 150 existing sandbar islands. When the lowlands are filled up with water from rain, stormwater runoff, spring the higher ground become the sandbar islands. This sandbar area usually become a breeding and foreground area for the birds.

6.5 Existing hardscapes

Currently, the facilities at the site are reflexology path, children playground, gazebo, and bridges. There are also electric supply and public phone. This lake is full of people on weekends and in the evening. Children often come here to play at the playground provided

6.7 Accessibility and circulation

There are two main accesses to the lake; from Jalan Bukit Keteri and Jalan Santan. There is no proper pedestrian pathway and jogging trek. The local people normally used their motorbikes and sometimes cars to enter the lake area. They rarely park their vehicles at the parking areae provided. The current main paths and parking area are covered by tarmac.

6.8 Future Development

This future development of this area to enhance the existing recreation area in as the are has the portential for tourism activities.. Bukit Chuping and Bukit Keteri provide a magnificent background view to the place.Overall area for Tasik Melati is 83.6 acre, current developments area is about 50.4 acre (60%) and future is 33.2 acre (40%).

The future development will consist of sport facilities such as badminton, and netball courts., freshwater fish aquarium, additional parking area, butterfly park, botanical garden, remote control car track skating ring, water theme park, golf driving range, chalets, camping ground, fishing area, eating area, buffer zones and sewerage treatment plant.

VII. CURRENT THREATS

7.1 Erosion

This area consists of 150 sandbar islands however 22 of these sandbar islands have collapsed due to erosion since 1999. This situation is called bank undermining or fretting. Fretting is the direct removal of material from an exposed underlying vulnerable soil layer by the continual movement of water (flow or waves) against the layer. Increase in water level will make continual contact with an exposed more readily erodible soil layer, also increase wave action due to boating, or change in prevailing wind direction due to the removal or addition of nearby obstruction including tree or buildings are the major cause. Activity proposed for future development such as boat race may lead to serious erosion in the area.



Fig 4 The tree collapsed due to unstable condition of sandbar island

7.2 Water pollution

The pollutions enter the wetland area by the stormwater runoff during rains. The main pollution are rubbish and chemical pollutants. Chemical pollutants come from the fertilizers use on the plants for maintenance. As a result it creates algae bloom. As more algae and plants grow, others die and this dead organic matter becomes food for bacteria that decompose it. With more food available, the bacteria increase in number and use up the dissolved oxygen in the water. When the dissolved oxygen content decreases, many fish and aquatic insects cannot survive.

7.3 Invasion of exotic species

The spread of exotic species in the landscape and waterways poses a threat to the local ecosystems and can undermine efforts for conservation and sustainable use of endemic, endangered and vulnerable fauna and flora. The native species of the area 'ikan tiung' are hard to find because of the excessively fishing activities and the introduction of other exotic species such as carp. It is believed that carp compete strongly with native and

introduced fish species and also water bugs affecting the variety of these organisms in the water. Carp rarely eat fish but eat fish eggs and larvae and also disturb the breeding sites of other fish species.

Similarly, new landscape plants are introduced to the area. For future development there will be probably more invasion of exotic species fish as the management is planning to attract fishing enthusiasts by putting in more freshwater fishes to the lake. Use of local and native species may retain the identity and character of the area.

7.4 Reduction of waterlogged area

The area designated for future development is about 30.2 acre which totally comprises of waterlogged area that can retain and absorb water. The elimination of 30.2 acres of the area for development, will reduce the capability of Tasik Melati to act as water retention area.

VIII. PROTECTION OF WETLAND

8.1 Erosion Control in Tasik Melati

In Tasik Melati erosion control matting made by either natural or man-made material is used at the bank of the lakes with the purpose of providing temporary soil stabilization while vegetative stabilization grows and the roots are able to take over. The individual plants bind into a single mass, which has substantially greater resistance to dislodgement by erosive water flow. This technique is suitable used where high flow velocity occurs for short periods (less than 9 to 12 hours). It is low cost and easily installed with non skilled labour, and is suitable over a wide range of flows. The disadvantages is mat can be damaged by slashing or mowing.

8.2 Wetlands and their contributing drainage areas

Wetlands are sustained by a variety of water sources, including surface runoff, precipitation, seasonal or periodic flooding, and groundwater. Specific landscape features that transmit water to wetlands are known as contributing drainage areas. While wetlands may be protected from direct impacts, such as dredging, filling, and draining, through federal and state permitting programs, their contributing drainage areas are seldom protected. Wetlands often occupy the low point of a development site, and can receive uncontrolled storm water discharges from upland areas. Storm water discharges cause indirect impacts to wetlands that can sharply degrade their function and quality.

8.3 Better Site Design

One of the best ways to mitigate the impacts of storm water runoff on downstream waters and wetlands is to control the way that development sites are designed. Better Site Design, also referred to as environmentally sensitive design, refers to a collection of site design techniques that reduce storm water runoff by minimizing impervious cover, conserving natural areas, and providing more distributed storm water management. Not only does Better Site Design reduce storm water impacts, it also is attractive economically, because Better Site Design developments can be cheaper to build, bring higher premiums, and sell faster than conventional developments, depending on the site design and local costs and market conditions. Tiffany Wright, et al. (2006)

8.4 Vandalism

One of the main social problems that occur to the area is vandalism. Some visitors were reported damaging the facilities and stealing 'Periuk Kera' plants for medicinal purposes.

IX. CONCLUSION

From the data collection and analysis it can be concluded that the current threats for Tasik Melati are erosion, water pollution, invasion of exotic species, vandalism and reduction of waterlogged areas. While one of the protection method applied in the area is erosion control matting. However with the plan for future development more attention should be given in the design so that the development will not cause the degradation to the area. Effort should also be made to protect the contributing drainage area as these are will directly contribute the degradation of the wetland.

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