PLANTS SUITABILITY FOR A FORMER MINING AREA

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ABSTRACT

Kuala Lumpur originated from mining activities and indeed mining was the major contributor to Malaysian economy. Upon exhaustion of profitable output from any mining area, the lands are then abandoned, which is common for non-renewable mineral's mine. Malaysia is probably the first country in the world to come up with a method to rehabilitate these lands laid waste by mining and turn them into tropical forest plantations.

Characteristics of soil that can be noticed at the mined land are sandy, unstructured, low nutrient content and have poor water retention qualities. Surface temperature tends to be relatively high, compared to other soil types. These are the major problems which need to be addressed immediately to facilitate development of the area into a scenic landscape area.

Such problems prolong the time taken by the plants to establish and survive with those conditions. One way of overcoming the problems is to add clay and organic matter to improve soil structure, water holding capacity as well as nutrient content. Regular and systematic fertilizing will help to add nutrients content to the soil. Mulching technique can be applied to the bris soil with the plantation to maintain the soil moisture. Referring to the topic of study, a list of suitable plants that can grow and survive on the bris soil will be concluded.

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chapter 1:
introduction

CHAPTER ONE

1.0 INTRODUCTION

1.1 Former Mining Area

Mining was once a major contributor to the Malaysian economy and indeed, Kuala Lumpur itself has its origin in tin mining. Other than Kuala Lumpur, the areas, which exist because of mines, are Larut, Kinta Valley and a few others.

After certain period of time when the mining areas are not profitable anymore, the mines will be left and become an abandoned area especially the non-renewable minerals' mines. In Malaysia, the most famous recreational areas that had been developed from a former mining area are Sunway Lagoon and Mines Resort City Center. Both examples are among the successful development of former mining area, which Sunway Lagoon has been developed as a water theme park and Mines Resort City Center has been developed as a recreational area and a golf course resort.

At this point, some of the mined land has turned up to be an attractive recreational area, some of them becomes a mere fishing spot and worse, some of the mined areas are a sore-eye scattered with wood left to not as the soil condition is not suitable for any plantation and fertility is very low.

1.2 Goal

It is hoped that at the end of this research, the findings can provide suitable plants selection for a former mining area to enhance the area's outlook.

1.3 Objectives

The main objectives of this topic are:

- To study the suitability of the soil for certain plants in a former mining area.
- To identify the characteristics of the plants.
- To understand the management of the soil and it's conservation activities.

1.4 Research Problems and Issues

Mining activities contribute certain percentage to the country's economy. Once the area is not profitable anymore, it will be left just like that and become an abandoned area. Normally, the area will be turned into a fishing spot, without any safety measure to the users. Sometimes, the area is just full with woods.

In this research, certain problems and issues have been noticed and perhaps by the end of this research, the problems can be resolved through suggestions and recommendations out forward.

1. Bris soil

The management of bris soil where normally this type of soil can be found in a former mining area. Bris soils are sandy, unstructured, has low nutrient contents and poor water retention qualities. Surface temperature tends to be relatively high, compared to other soil types.

2. Suitability of plants

Only certain plants can survive on bris soil that is found at a former mining area. In order to select the suitable plants in developing a former mining area into scenic landscape area, some alteration need to be done.

3. Soil fertility and characteristics

Characteristics of soil and its fertility level which includes physical, chemical and biochemical characteristics are essential for a certain plants to survive in a former mining area.

1.5 Methodology

There are two types of methods that need to be considered in collecting the data; the qualitative method and quantitative method. The qualitative method implies a particular philosophical orientation and the choice of problem, which is exploratory, interpretive, cultural or process directed. On the other hand, the quantitative method samples a wide range of phenomena and emphasizes the reliability of measures (Asiah, 2001). The research method that has been selected for this study is mainly

based on both the qualitative method and the quantitative method in order to obtain precise and accurate information on the data gathered.

1.5.1 Literature Review

Literature review needs to be conducted in order to understand and get detailed information about the topic. For this topic, a number of relevant books were referred to. Beside that, journals, thesis, magazines, internet and newspapers are among the sources used to compliment the information.

Part from that, surfing the Internet is one of the method undertaken to gather information for this topic which has been the easiest and fastest way. It is hoped, these data gathered from literature review will help to resolve the problems and issues raised. Bibliography at the back of this research will list the references used for this topic.

1.5.2 Case Study

In order to study the plants suitability for a former mining area, three case studies have been selected. The areas are Taman Tasik Titiwangsa, Forest Research Institute Malaysia, Kepong or commonly known as a FRIM and Taman Metropolitan which is also located at Kepong. The areas were selected because these are the best examples of former mining areas, which now have been turned into famous recreational areas. Most importantly all three case studies have used a variety of plant characteristics as a part of their design.

1.5.3 Data Collections

To have a good and successful research, it requires detailed and well-planned research methods. Gathering the information and data collection are the things that need to be done along the research process. Furthermore, three case studies shall be undertaken in order to achieve the aim and objectives of the research. Observation and interview shall be conducted to strengthen the research argument about all of the case studies. Finally, data collected shall be analyzed and used to give the best solution on the research issues.

1.5.3.1 Observation

This method is conducted on site and it employs vision. This type of method is done on certain aspects especially on the type of plants that can be found at the three case studies including its morphology, taxonomy and nomenclature. This is also to get first hand information without relying on secondary data as well as to know the current situation on all three case studies.

1.5.3.2 Taking photographs

This type of research method is actually to support the data that had been collected and to strengthen the research argument. It is an aid to visualize the area and the current situation for all three case studies.

1.5.4 Data Analysis

From the methods discussed above, the data will be transformed into statistic and useful data. By analyzing the data, perhaps a list of suitable plants selection can be provided and will be useful in the future. Graphs, pie chart, findings and recommendations will be based on the data that being analyzed.

1.6 Conclusion

Former mining area which we usually overlook and abandon has the potential to be developed as a recreational park, urban park, residential area and others. A lot of actions need to taken before any development can be done on the area especially for any landscape project. The development will take a longer time to be successful development compared to other projects as the former mining area soils has problems in terms of fertility, characteristics and others.

chapter 2: plants suitability for a former mining area

CHAPTER TWO

2.0 PLANTS SUITABILITY FOR A FORMER MINING AREA

2.1 Introduction

The former mining area that had been developed as a recreational area needs a selection of suitable plants in order to become more attractive. For examples, on Friday, August 23, 2002, there was a report in The Star newspaper about the redeveloping of Kinta Valley. The Kinta District Structural Plan (1995-2020) recommends that scenic landscapes of former mining lands should be conserved to promote the unique identity of Kinta Valley, which has been known as the "District of a Thousand Lakes." One of the factors that the designers have to take into consideration to create the scenic landscapes of former mining lands is the selection of goods and suitable plants that can survive in the condition.

2.2 Background study

2.2.1 Current types of mining industry in Malaysia

According to research done by Department of Environment Ministry of Science, Technology and Environment, Malaysia in 1995, tin mining industry in Malaysia can be divided into seven categories which are:

1. Tin mining

-Alluvial dredging

-Lode mining

-Open pit mining

2. Gold from surface or underground mining

3. Bauxite mining
4. Copper from surface mining
5. Coal mining
6. Iron mining
7. Industrial mineral including barite, kaolin, clay, silica sand, limestone and dimension stone

2.2.2 Landscape sustainability criteria

Erosion is the main and important problem or obstacle that needs to be solved for establishing the sustainability of mine-closure landscape (Martin, 2000). With the type of soil, which is mostly sandy, the final landscape that can be defined in term of contouring, replantation and provision of drainage systems may also be specified in terms of natural analogues. A sustainable landscape must:

- Provide suitable terrain for appropriate terrestrial ecosystems.
- Generate runoff with similar characteristics to the natural hydrologic regime of downstream receiving systems.
- Provide landscape features that are not susceptible to high rates of erosion such as through gullying.

Sustainable landscape features can be designed by examining the natural analogues for vegetation, drainage networks, valley slopes and other landscape textures.

2.2.3 Trees for long-term stability

Almost all ex-mining land can be rehabilitated to support some form of vegetation, at least in the short term. However, not all land is sufficiently valuable to be reclaimed to the highest level possible (Binns, 1983; Leopold and Wali, 1992; Moffat and McNeill, 1995). Trees that being planted on mined soil actually can restore the soil plants system at significantly lower cost than conventional improvement and maintenance procedures (Haigh, 1992). Furthermore, the established trees actively help the land to recover from mining through natural soil building processes. However, the process takes time, trees grow slowly on such site and they are more expensive. Yet, once the trees are established, maintenance requirement can be minimal (Richardson, 1987).

The slow growth of trees on most former mine sites are caused by low fertility and poor soil structure. It means that economic targets must be set realistically low. If timber harvest is an objective, attention is generally paid to maintaining the desired species, reducing competition from shrubs and grasses and encouraging maximum productivity. By contrast, after initial establishment, non-commercial reforestation plantings are often left to develop through the forest's natural regenerative capacity and may ultimately achieve the same ecological end. Besides, planting trees on the mines land can provides initial tree cover and may provide the potential to maximize future forest development (Ashby, 1980).

2.2.4 Tree planting techniques

Tree planting is usually considered a simple and straightforward routine. The technique is to provide a hole sufficiently large to accommodate the root ball or root system, backfill with an amended soil, while thoroughly watering the soil and root ball as backfilling progress. However, there is a problem that is favorable and sufficient soil for rooting do not exist for most trees planted in the urban area especially in a former mining area.

Cox (1996) discussed the five criteria that tree planting, or more properly, the urban soil, must provide to the tree. These are:

- Sufficient amount of good soil
- Sufficient moisture
- Proper drainage
- Proper aeration of the soil
- Supply of plant food

2.2.5 Chemical characteristics of bris soil

The unavoidable disruption of soil and rock profiles during mining suspends the biochemical processes essential to the operation of the soil system and the growth of plants (Juwarkar, 1994). Organic matter accumulation, soil particles aggregation and mineralization of nitrogen and carbon cease to operate following mining and may take several decades to re-establish. Without organics colloids and clay particles with charged site, which can participate in ion exchange readily, leached from the root zone (Tan, 1993; Paul and Clark, 1996). A significant factor limiting plants growth on mined

land is the deficiency of plants containing nitrogen, potassium and phosphorus (Ang. 1998). Besides, low cation exchange capacity (CEC), low nutrients and poor water capacity makes the limiting factor of afforestration on sands tailing more difficult (Binns, 1993). There is study indicating that tin tailings continue to lose clay content to erosion for a prolonged duration after dumping, for example 6.3% clay in five years old tin tailings compared to only 2.4% found in 20 years old tin tailings (Ang, 1994). In his report, Ang also mentioned that natural restoration of bris soil in terms of fertility is very slow. A 20 year old area of bris soil has only about one-twentieth the fertility of a 20 year old plantation. The low percentage of clay in tin tailings makes the establishment of seedlings more difficult because it reduces the cation exchange capacity (CEC) as like has been mentioned previously and water holding capacity of the tin tailings, as previously mentioned.

2.2.6 Physical characteristics of bris soil

According to the report from Jabatan Pertanian Semenanjung Malaysia (1993), type of soil that can be found at a former mining area is a bris soil. Bris soils are sandy, unstructured, has a low nutrient content and poor water retention qualities. Surface temperature also tends to be relatively high, compared to other soil types. Management of crops on bris soils includes the incorporation of organic matter or compost, staggered application of fertilizers, prudent water management (less quantity, more regular) and having mulches on planting beds. With a proper management and irrigation, bris soil area can be cultivated by certain plants selection

Before any cultivation, the soil must be specified, the source investigated and the material tested and analyzed, handled and installed and maintained just as carefully as the plant palette and its stock (Craul, 1994). This is to make sure that the plants can grow well with the bris soil. The high percentage of sand in a texture of bris soil is dependent on the age of the mined land. Even after 20 years, weathering and vegetations still influence the texture of the tin tailings (Ang, 1994). Palaniappan reported that the field moisture content of sand tailings can be low as 1 ml/100g. The high porosity of sand particles bris soil reduces the water retention capacity, and the low water table level in the sloping terrain of bris soil also contributed to its low moisture contents (Ang, 1994).

Part from that, the high temperature of sand tailings during the day is another limiting factor for tree planting (Ang, 1994). The high temperature of bris soil nearly exceed the 50% heat killing temperature of primary rain forest species, which ranges from 43.9°C to 51.7°C (Ashby,1980). From the statement, it is clear that most of the high value timber tree species from natural forest are not suitable for planting on bris soil or mined land.

Time	9.30	10.30	11.30	12.30	13.30	14.30	15.30
Depth (cm)	34.4	39.4	44.4	47.7	48.3	48.8	49.4
Surface	28.9	30.0	32.2	35.6	36.7	38.3	38.9
10	27.2	27.5	27.7	28.9	30.0	31.1	32.2
20							