Integrated Upland Forested Watershed Management

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Introduction

Various attempts have been made to study the characteristics of upland forested watershed in Malaysia (Nik Muhamad *et al.*, 1994, Mohd Zaki and Nik Muhamad, 1998). Not many of the previous studies conducted in Malaysia are in an integrated manner which comprise of various related disciplines (Lai, 1985). Watershed should be treated as a management unit and thus the development (includes rehabilitation) of watershed resources should be considered what is socially, culturally, physically, chemically and biologically acceptable (Goze *et al.*, 1985).

Related research has been conducted to evaluate the hydrological priorities of watershed development as far as water resources is concerned (Wan Nor Azmin *et al.*, 1995)and also the evaluation of impacts of logged-over forest on selected environmental parameters (Mohd Kamil *et al.*, 1999). The results from the above study showed that more areas of investigation should be considered in order to come up with more concrete recommendations for upland forest watershed management.

Materials and Methods

Fieldwork activities was carried out by establishing a common sampling loactions for water and hydrological measurements within the Pelauur and Tau-u River Basin and the respective data was collected and integrated. All the related *in-situ* data pertaining to the study sites and vicinity was collected.

The analysis includes soil, water and hydrologic regime. The analysis and sampling procedures were based on the standard methods for each respective areas. All the data and information obtained from the fieldwork were statistically analyse

Results and Discussion

The topography within the proposed site can be classified as undulating to steep terrain with slopes ranging from 6° - >20°, and at a height of about 1,000 - 1,300 metres a.s.l. About 15% of the area have slopes ranging from 6° - 12°, 68% have slopes ranging from 12° - 20° while 17% have >20° slopes.

The project site is located within the Pelauur and Tau-u River Basin, to the west of the Belatop River Basin. About 80% of the total 1,917 acres is within the Pelauur River Basin and the balance of 20% is within the Tau-u River Basin. These two rivers flow into Sg. Brook, one of the upper tributary of Sg. Neggiri which is one of the major rivers in Kelantan. The rivers in this hilly area are mostly shallow, narrow and fast flowing.

Currently, the hydrological system of the area is not degraded and considered active. This could be due to the highly vegetated area, high annual precipitation and undisturbed soil condition that led to high infiltration. The velocity of water flow in most of the tributaries are high which indicates insignificant interference existed to the system and also due to the steep gradient.

The main soil series in the area is Ringlet series with clayey laom texture on the surface, while sandy clay loam occupies the deeper layers. As the area receives high rainfall and exists on steep slopes, it is subjected to high erosion risk and slope failure.

Under natural forest condition, erosion is minimal. However, the cutting and filling expected in carrying out this project will pose high risk to the area and the downstream activities. Intensive land clearing and soil disturbance for construction of the infrastructures required in this project will increase the erosion magnitude. The estimated soil loss during the construction stage is 260 tonnes/ha/year. This figure far exceeds the acceptable rate for Malaysia which is 1-8 tonnes/ha/year.

Water quality assessment was conducted at various locations along Sg. Pelauur, Sg. Tau-u and Sg. Ledled. The sampling points were selected in such locations to cover the upstream and downstream of the project site. Currently, the water quality of the area is categorized as Class II.

Conclusions

Pelauur and Tau-u river basins are located in a hilly area and has steep slopes at the edge. Based on the high total annual rainfall for this area, Sg. Pelauur becomes one of the most important rivers which supplying water to other areas.

Due to the high precipitation experienced in Malaysia and situated on steep slopes, the major environmental risks within the study sites are mainly water-induced problems. Therefore, the area is subjected to high erosion risk and slope failure (including landslides and rock falls).

Overall, according to the classification based on the water quality index (DOE-WQI) method, the river at the project area can be categorized as Class II which only needs conventional treatment for water supply and is able to cater to sensitive aquatic species.

Benefits from the study
Management strategies for highland development projects especially concerning with environmental conservation.

Patent(s), if applicable:
Nil

Stage of Commercialization, if applicable:
Nil

Project Publications in Refereed Journals:
Not yet published

Project Publications in Conference Proceedings:
Not yet published

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