Watershed prioritization for effective water resource management

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INTRODUCTION

Freshwater availability in Malaysia is diminishing, and without appropriate action and management the country will be in shortage of the resource soon. Thus it is necessary to develop a sustainable water resource management plan and identify proper, suitable and effective water resource management approaches and techniques.

WATER MANAGEMENT ISSUES IN MALAYSIA

Three water management issues identified were: (i) surface water management issues; (ii) groundwater management issues; and (iii) integrated river basin management issues.

Rivers, lakes and natural or manmade reservoirs are the major surface water resources in Malaysia. Malaysia also receives high volumes of rainfall, with mean annual rainfall of about 3000 mm. Thus theoretically, there is enough renewable water. However, issues regarding water supply still arise and proper management of surface water resources is required.

Because of favourable conditions and rainfall, a substantial volume of groundwater exists, and this is a very important alternative for water resources. Identification of areas with potential groundwater resources is necessary for the purpose of balancing surface water and groundwater for optimal utilization.

Sustainable water development faces several obstacles, such as: (i) fragmented sector policies, (ii) weak and inadequate coordination among sector agencies, (iii) lack of adequately trained and motivated manpower, and (iv) inappropriate use of technologies. Thus an integrated approach to the management of catchment area is required for an effective water resource management. Remote sensing with its unique capabilities of synoptic coverage, repetitively capturing features of inaccessible areas, will impact most water resource management and decision making. Thus the focus of this study is to highlight one of the approaches that can be used in the management of a watershed, that is the approach known as watershed prioritization. This study is carried out in the Sungai Selangor Watershed, as shown in Fig. 1.

OBJECTIVE OF THE STUDY

The main objective of this study is to give priority to the sub-watershed based on the critical level of the sub-watershed. The critical level of the sub-watershed in this study was determined by identifying the status of water quality and the rate of soil erosion occurring in the sub-watershed.

MATERIALS AND METHOD

Data used in this study include satellite images (Landsat-5TM and Radasat), ancillary maps (topographic map, land-use map, soil map and erosion potential map), water quality data (pH, dissolved oxygen, DO; biochemical oxygen demand, BOD; chemical oxygen demand, COD; and ammoniacal nitrogen, AN) and also meteorological data (annual rainfall).

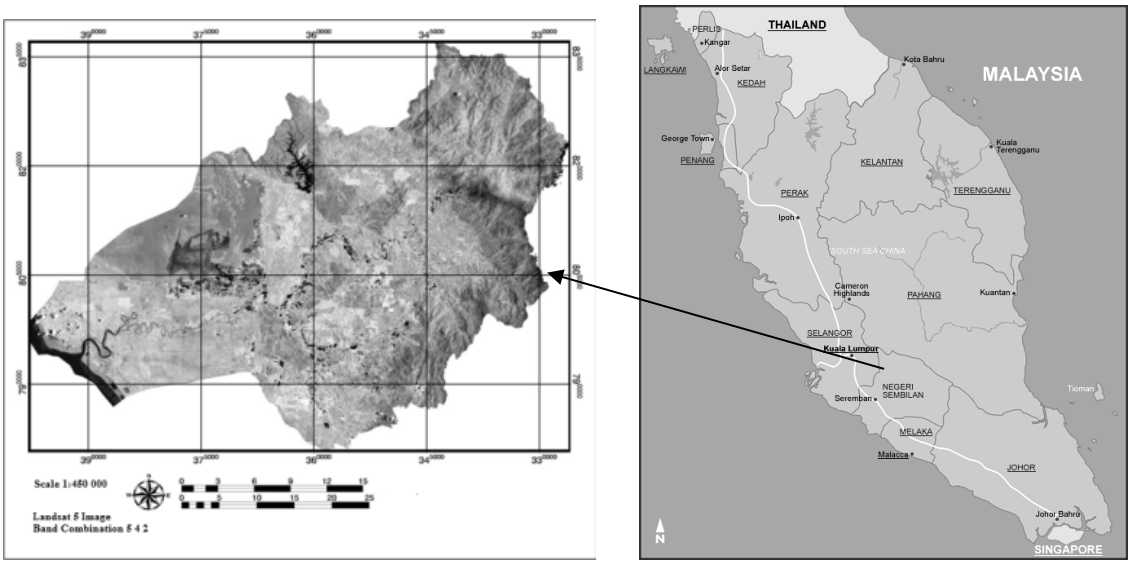

Fig. 1 Location of the study area.

Once all the required data and information were obtained, the first step was to delineate the boundary of the sub-watershed. Analysis on the status of water quality and the potential soil erosion risk were then carried out to determine the critical level of the whole sub-watershed. The status of water quality was evaluated based on parameters such as pH. The soil erosion risk was calculated using the Universal Soil Loss Equation (USLE). The critical level of the sub-watershed was then determined using the Numeric Index Approach, where each sub-watershed was given a score according to the water quality status and the soil erosion risk.

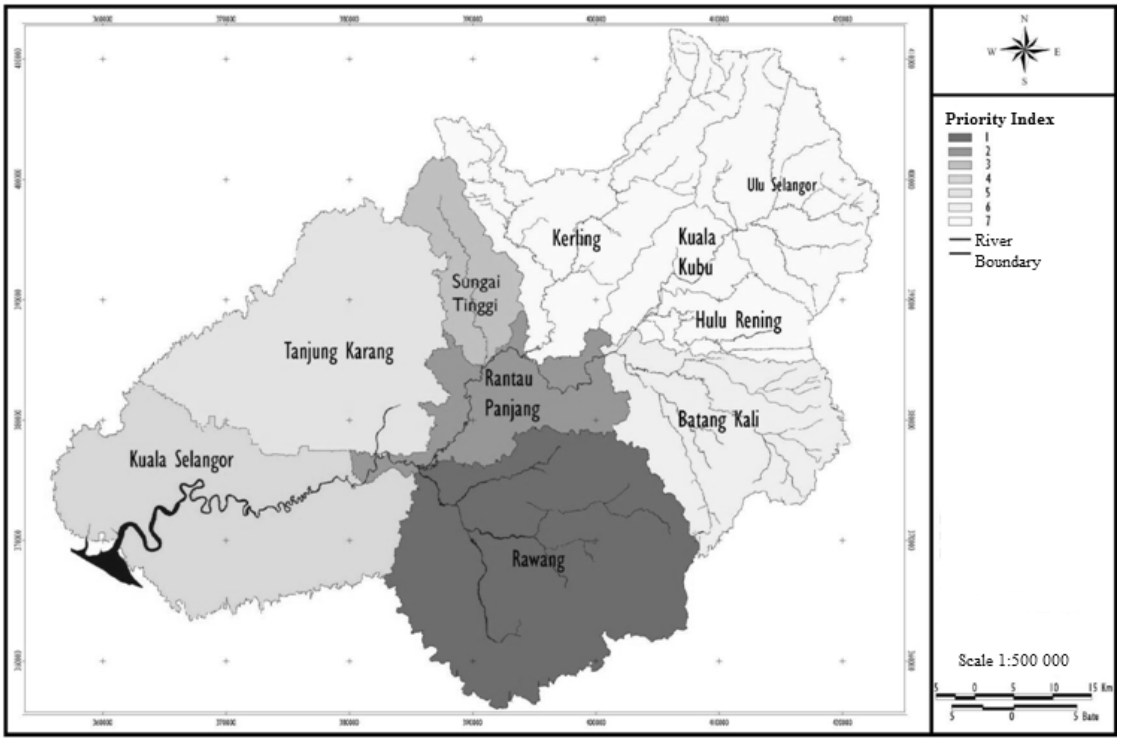

Fig. 2 Priority map showing the critical level of sub-watershed.

RESULTS AND ANALYSIS

The main result of the study is the sub-catchment priority map, as shown in Fig. 2. The sub-watershed with highest severity score is considered as the most critical and this sub-watershed required the most attention.

CONCLUSION

Proper and effective management is very important to ensure the sustainability of water resources in any particular area. The approach suggested in this study, that is giving priority to the sub-watershed is one of the effective techniques that can be used in watershed management.

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