

MANAGEMENT OF RIVER POLLUTION AS A TOOL IN WATER RESOURCES MANAGEMENT: SOME EXAMPLES FROM MALAYSIA

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Introduction

Rivers are the life veins of Malaysia, being important "water highways", sources of food and water, draining water-logged areas and being habitats of important ecological systems. The country is drained by 150 river systems, of which 100 are in Peninsular Malaysia and 50 in East Malaysia Sabah and Sarawak (Figure 1). Within these river systems is an estimated 1,800 rivers and major tributaries, with a total length exceeding 38,000 km. The largest river in Malaysia is Sg. Rajang with a catchment area of 51,000 sq. km while in the Peninsular, it is Sg. Pahang with a catchment of 29,000 sq. km. By world standards, Malaysian rivers are short and steep (Hj Keizrul Abdullah 1999). Rivers are the main water source contributing about 97 % of water needs in the country. Unfortunately, rivers are also used for a variety of purposes that pollute and degrade them, ultimately threatening both the quantity and quality of their waters.

During historical times, rivers were the hub of life with not only the major settlements lining the banks but rivers also play an important role in the economic and social life of the people (Kennedy 1967). Since independence in 1957, however, Malaysia has developed steadily changing from a rural economy based on agriculture and tin mining to an export based manufacturing economy. Over the last three decades, the transformation has been unprecedented with very rapid urbanisation and industrialization (Jomo 1994). The change from rubber estates to oil palm and the opening up of extensive tracts of land by the Federal Land Development Agency (FELDA) coupled with uncontrolled logging transformed the land use from one of mainly forest and food crops to one of estates (cash crops) and townships (International Law Book Services 1991:185). This was followed by expansion of urban, commercial and industrial centres. All these developments have overstressed river systems. As a result, many river basins have reached their limits of water supply and are now susceptible to water stress and droughts. The occurrence of low flows is exacerbated when rapid development has produced great amounts of human wastes as well as wastes from all of man's activities, including agriculture, industrial, commercial and transportation wastes (Kung

1986; Hamirdin 1993). This has resulted in a great number of rivers that are very polluted, some to the extent of being not rehabilitable. Yet, many rivers can be restored and rehabilitated given the right kind of efforts. Deforestation has also led to the opening up of large tracts of land within river basins and this has resulted in not only increased sediment loading in the river systems but also in the aggravation of floods which further pollute the waters (Chan and Kung 2000; Chan, Kung and Wan 2000). Related to deforestation and development of hill land is the high incidence of erosion and landslides (Chan and Wan Ruslan 1997). These events lead to sediment pollution of rivers. Further downstream, the excess runoff from the heavy tropical rainstorms inundate large tracts of land, causing damage and economic losses with significant loss of life (Chan 1995). At other times, low water levels during periods of drought result in water shortages leading to rationing of supply, interruptions to commercial and industrial activities, and losses to agricultural production. Furthermore, the rapid pace of development of the past three decades have exacerbated the situation and many of the urbanized areas have been affected and are still facing acute water shortages (Chan 1998 and 2000).

Sources of River Pollution

Notwithstanding its important ecological functions, rivers are Malaysia's major source of fresh water, contributing some 97 % of total water supply. Malaysia is well endowed with copious rainfall and abundant water resources. With an average annual rainfall of 3,000 mm, there is an estimated 566 billion m³ of water running off into the river systems each year (Hj Keizrul Abdullah 1999). Yet, many parts of the country are still experiencing water stress. Presently, 25 river basins have been identified as areas experiencing water stress. In its natural state, rivers have built-in self-purification abilities, i.e. they can absorb and cleanse themselves of wastes and impurities. Hence, they can maintain a level of river water quality that is able to enrich the natural beauty and to support humans as well as the diversity of riverine flora and fauna. However, rivers have their limits. Disruptions to the natural river basins via opening up of catchment areas for polluting