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SQUATTERS, FLOODPLAIN OCCUPATION AND EFFECTS ON RIVERS: SOME EXPERIENCES FROM MALAYSIA

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ABSTRACT

Malaysia is a rapidly developing country, one of the 'tiger' economies of Asia and on the verge of becoming a developed nation. Despite such achievements, there are many socio-economic problems that remain unsolved. Among those problems are poverty, the uneven distribution of income, landlessness and squatting. Rural–urban migration since the 1970s, and international migration (including illegal migration) since the 1980s, has exacerbated the problem. Squatters, in thousands of squatter colonies, have occupied urban flood plains, to which urban sprawl and increasing populations have greatly contributed. Structural forces trap squatters, and so continue to occupy flood zones; and because they remain poor, they have low mobility and are thus very exposed and vulnerable to flood hazards. Flood losses are high, and a significant portion of income is used for recovery and rehabilitation after floods. Political forces also reinforce squatting, as political parties and squatting are closely related. Squatters, without proper sanitation and garbage disposal, also dump their garbage and wastes into rivers. Hence, squatters are one of the main sources of river pollution. The authorities need to realise that no amount of river cleaning and conservancy will be effective if they do not address the squatter issue. Amongst the possible solutions include low cost housing, relocation, improvement of job opportunities in rural areas, and environmental awareness and education.

INTRODUCTION

About 29,000 square kilometres, or nine percent of the country, is flood-prone (Photo 1), affecting some three million people—12 per cent of the total population (Keizrul Abdullah 1999). The losses sustained each year from floods are significant (the annual flood damage potential being some US$ 26.3 million), and loss of life is also common. Why then do large sections of Malaysian society still persistently settle on flood plains? This paper examines the extent to which choice of settlement in urban flood plains is constrained by squatting, an exogenous 'structural' force that is beyond the individual's control. In theory, Malaysia is a capitalist country practicing free enterprise, and individuals can expect to have choices in

residential location. However, in practice, exogenous structural forces such as squatting, politics, economics, poverty, landlessness and low occupational mobility severely limit where individuals choose to live. The more individuals are 'controlled' by these forces, the fewer choices they have. The majority are forced to inhabit hazardous flood plains and become more disadvantaged and vulnerable to flood hazards. For example, impoverished squatters are more severely constrained in their response to flood hazards and find it more difficult to recover than those who are economically better off, even though both groups inhabit the same environment. Squatters are typically 'marginalized' communities trapped by a circle of poverty. Hence, the range of choices open to squatters depends on the extent to which they can free themselves from these forces. Chan (1995a) demonstrated the constraints that limit such choices, and that in turn result in the persistent occupation of flood plains by large sections of Malaysian society.

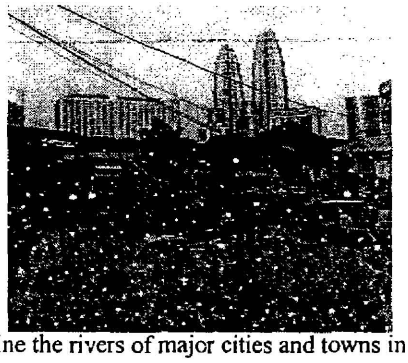

Photo 1. Squatters line the rivers of major cities and towns in Malaysia and live in squalid conditions without sanitation, waste disposal and other amenities.

This paper discusses the reasons why a significant proportion of rural–urban and international migrants end up inhabiting flood-prone areas, and focuses on the structural forces, which confine them to their present locations. It goes on to analyse poverty, landlessness and low occupational mobility as the main forces constraining migrants from leaving the flood plain. The scope for individual manoeuvre/action is severely limited by these forces. The analysis is supported by results from structured interviews with members of 618 flood-prone households. The interviews were completed in four sample locations: two on the West Coast, Kuala Lumpur (N = 114) and Pulau Pinang (N = 172); and two on the East Coast, Pekan (N = 140) and Kelantan (N = 192).

In rural flood plains, many studies have shown that people are strongly influenced to remain or stay by custom, tradition, ethnic values, the kampung (village) way of life, traditional land inheritance, and government relief and other forms of agricultural or rural development aid (Burton et al. 1978). These forces exert a strong influence on individuals, and largely control their choice of location and range of actions in flood hazard response. Figure 1 is a hypothesised model depicting individual choice to stay or move/migrate within the confines of poverty and other structural forces. The wealthier group of individuals and a minority of their poorer counterparts (e.g. those who are fortunate to be resettled or chosen as settlers in government land schemes, those who have wealthy relatives and the more adventurous) have access to the move or migrate option. The majority of the poor are deprived of the move/migrate option. Despite their relative freedom from structural constraints offering better accessibility to the move option, the wealthier group may not move as they are influenced and constrained by cultural forces. Therefore, like their poorer counterparts, they stay and seek to protect themselves from flood hazards.

Reasons for the Persistent Occupation of Flood Plains in Malaysia

In Malaysia, the persistent occupation of flood plains is mainly caused by 'structural/societal' factors rather than by individual choice. Research on flood hazards indicates that although many flood plain occupants are willing to be relocated, the lack of opportunities, choices and government incentives has prevented them from doing so (Jamaluddin Md Jahi 1985). Kates (1962) gives five reasons why people persist in occupying flood-prone areas:

1) They do not know about the flood hazard, and are therefore not unduly concerned;
2) They know about the hazard, but personally do not expect a future flood, and therefore are not unduly concerned;
3) They expect a future flood, but do not expect to bear a loss, and therefore are not unduly concerned;
4) They expect to bear a loss, but not a serious one, and are therefore not unduly concerned;
5) They expect to bear a serious loss, and are concerned; they have therefore undertaken, or are planning to undertake, some action to reduce the losses.

To these five reasons, Fordham (1992) has added another two:

6) They expect to bear a loss, but accept this outcome as an acceptable cost of enjoying the locational (environmental) benefits;

7) They had little or no choice in location, and/or have little or no choice but to stay.

While each of the above reasons is valid by itself in hazards research (most such research has identified one or more of them), not all of them will be applicable to flood plain occupants at all times. In Malaysia, reason no. 7 is the main reason why people persist in living on flood plains.

Although a high level of 'unawareness' of flood hazards has been found amongst flood plain occupants (Liu & Chan 2001), the level of hazard awareness amongst those who have lived in an area for some time is generally high (Fordham 1992). In Malaysia, reason no. 1 is unlikely, as there are probably very few people who actually do not know about the hazard (with the possible exception of some new residents who have moved into the area from elsewhere). Survey results reveal that 436 respondents (70.6 per cent of total) voluntarily mentioned flood as the most important disadvantage in their locality—before they were told that the interview was about flood hazards. This group of respondents, therefore, has a high awareness of the flood hazard. Moreover, when respondents were asked whether or not floods affected their locality, 95.3 per cent gave a positive reply, indicating flood awareness. Survey results indicate that the majority of flood plain occupants (66 per cent) expect floods to occur in the future. Furthermore, 80.4 per cent of respondents were found to be pessimistic, i.e. they expect a higher frequency of flooding than that actually occurring. Thus reason no. 2 is unlikely to explain continued flood plain occupation in the country.

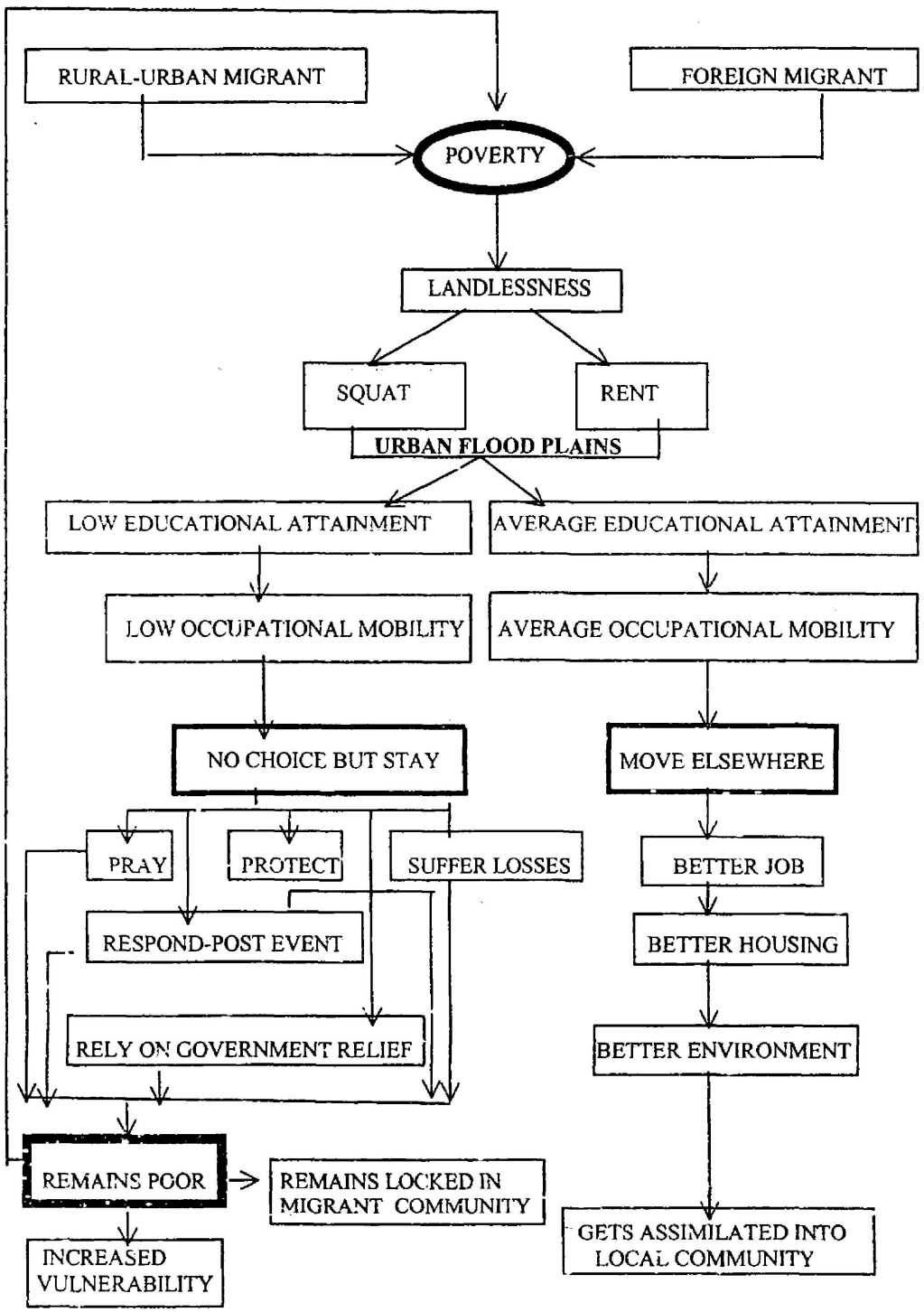

Figure 1. A model of persistent flood plain occupancy depicting the influence of poverty on other structural forces which in turn lead to the "Stay" or "Move" options of individuals.

Reasons nos. 3 and 4 are probably only valid in the areas where the flood hazard is not so severe, for example in areas with flood frequencies less than ten in one year. Flood frequencies and magnitudes are low in these areas (the depth of flooding is usually lower than the stilt height of houses); respondents may expect future flooding, but do not expect to bear more than a minor loss, if any, and are therefore not unduly concerned. Results from the current household survey indicates that 64.8 per cent of those living in areas with a flood frequency of one year in ten or less believe that floods are not serious. Based on this, it can be assumed that they do not expect to bear any great loss in future floods. Furthermore, only 48 (37.8 per cent) out of 127 respondents living in areas with a flood frequency of one year in ten or less experienced a flood loss in the most recent flood (Photo 2).

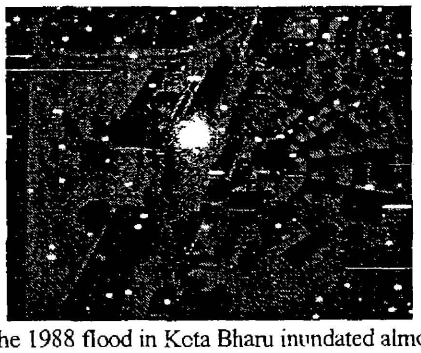

Photo 2. The 1988 flood in Kota Bharu inundated almost the entire town.

Nos. 5 and 6 are two common reasons why people persist on the flood plains in Peninsular Malaysia. Flooding occurs almost annually on the East Coast and in other flood-prone areas on the West Coast. People who persist in such areas expect to bear serious losses, and have taken or are planning to take positive action to reduce them. They expect such losses, and accept them as an unavoidable cost of enjoying the locational benefits of cheap land, fertile soil, proximity to the work place, and other benefits. In the current household survey, 84.5 per cent of all respondents had taken steps to reduce flood losses. When respondents were asked to indicate the most important advantage of living in their present area, 494 (79.9 per cent) indicated various locational benefits; these include the owning of land in their *kampung*, proximity to a nearby town, proximity to the work place, proximity to relatives, and proximity to public amenities such as hospitals, schools, etc. Also, of those who intend to remain on their present locations, 54 per cent gave reasons associated with locational benefits.

No. 7 is the main reason why a significant proportion of Malaysians live on flood plains, and also why the majority continue to remain on them. It applies most appropriately to the landless and impoverished, who have neither the choice of moving elsewhere nor the resources to do so. A fifth of those interviewed do not own their houses, and are landless; and if this latter category includes squatters (who own the houses but not the land), then 38.2 per cent of respondents are landless. In Malaysian society, rural peasants and urban squatters are the two main groups associated with reason no 7. The current research has found of those who reported that they had no choice in location, 21.8 per cent were squatters. Among flood plain squatters, more than half revealed that they live there because they have no choice. Rural peasants (farmers and fishermen) represent 25.2 per cent of those reporting the absence of choice in their location. More significantly, 32.3 per cent of farmers and 28.9 per cent of fishermen indicated that they occupy flood plains because of the lack of alternatives. On the whole, a total of 533 respondents (86.3 per cent of the total sample) indicated that they would continue to live in their present location despite the flood problem. Given the magnitude and frequency of flooding in the sample areas, this is a strong

indication that flood plain inhabitants have little or no choice but to stay. For example, 37.9 per cent of respondents who intend to remain in their present locations quoted reasons such as 'I have no money to move', 'I have nowhere to go' and 'It's the same everywhere'. These responses indicate that the respondents have little or no choice but to continue to occupy flood plains. Farmers who attempt to move are either the better-off, or the more fortunate ones who have external help (from relatives, friends or the government). Even those who migrate to urban areas may be confronted with high rents and shortages of low-cost housing, forcing them to occupy urban flood plains as squatters (Chan & Kung 2001).

In this study, 75.2 per cent of those respondents who indicated that they had no choice but to remain in their present location are aware of the flood hazard. Obliviousness is, therefore, not a valid reason why the majority of Malaysians continue to live on hazardous flood plains. Being optimistic about economic opportunities, as has been documented by Saarinen (1966) with respect to Great Plains farmers, is also not a valid reason for Malaysian flood plain occupants, who exhibit a high degree of pessimism. For example, 78.9 per cent of all respondents are classified as 'pessimistic', over-estimating as they did the number of flood years when compared to the actual flood frequency. Amongst those who had no choice in location, 65.2 per cent were pessimistic. Furthermore, expectation of future floods was generally high amongst respondents: for those who had no choice of location, more than half estimated there was at least a 50 per cent chance that flooding would occur in the next few months. With the same level of expectancy for future flooding in the next year, the number of respondents was 83.2 per cent. More than three-quarters of those with no choice of location were certain that flooding would occur in the medium term (in the next five years) and long term (in the next ten years).

Thus, despite high levels of awareness, pessimism and expectation of future floods, people continue to inhabit flood plains—this persistence cannot be attributed to ignorance. Neither can it be attributed to 'optimism' or 'low flood expectancy'. People are forced to inhabit flood plains by structural forces beyond their control.

Squatting and Flood Plain Occupation

In Malaysia, squatting is a major structural force, which creates and exacerbates urban flood hazards. It results from a combination of poverty, landlessness, rural–urban migration (to search for better paying jobs), the influx of illegal immigrants from neighbouring countries, and other structural causes. Since urban flood plains are probably the only vacant space left undeveloped in the cities, squatters inevitably occupy these flood-prone areas, and consequently become exposed to flood hazards. In urban areas, squatters are the most vulnerable group of people, as they are amongst the poorest in Malaysian society, and least able to recover from a flood disaster (Chan 2000). Squatting is a significant social problem in Malaysia (Chan 1996); and squatters are largely forced by structural/societal forces into continuing to live on flood plains (Chan 1997a).

Squatting is both a historical and a modern phenomenon. During the colonial period, squatters were mainly immigrant Chinese and Indians, but after independence squatting by Malays, as a consequence of rural–urban migration, also became a problem (Azizah Kassim 1982). In 1957, one out of three persons in Kuala Lumpur was a squatter, and there were as many as 20,000 squatter families. By 1980, there were 48,709 squatter families in Kuala Lumpur, and this figure has been estimated as increasing at a rate of 9.7 per cent annually. Wan Abdul Halim (1982) has identified 202 squatter settlements in Kuala Lumpur, the majority of which lie on flood-prone areas near the main rivers running through Kuala Lumpur. Kuala Lumpur is only one example; all the major urban centres in Malaysia have squatter settlements, and they have become one of the country's emerging problems (Aitken et al. 1982). For example, Ipoh, Johor Bahru and Prai have approximately 60,000, 50,000 and 20,000 squatter families respectively. In the current research, a total of 110 squatter

households (17.8 per cent of all households) were surveyed. The breakdown among the sample areas are as follows: 36 squatter households in Pulau Pinang; 26 in Kuala Lumpur; 26 in Kelantan; and 22 in Pekan. Squatting on flood-prone areas in urban centres is a major social problem facing the authorities. Squatters live in the most hazardous of flood plains simply because they are too poor to live anywhere else. In the current survey, it was found that 62.9 per cent of squatter households had been flooded ten times or more in the previous ten years, compared to 43.3 per cent of non-squatter households.

As stated earlier, squatters have little or no choice in location and/or have little or no choice but to stay. According to Wan Abdul Halim (1982), squatting is a phenomenon arising from a basic human need for shelter. There are many categories of people who become squatters: those who have just migrated to towns and cities; those who have moved out of their parents' house; illegal immigrants who have migrated into the country (mostly Indonesians and Thais); the landless and homeless who have capitalised on empty unoccupied land; others who simply cannot afford housing of any sort. Squatting is a process reinforced by broader socio-economic and political forces—the contextual forces examined by Chan (1997b). Elsewhere, Mitchell et al. (1989) have also developed a contextual model whereby contextual forces exert a strong influence on natural hazard vulnerability. Mitchell (1990) has argued that such contexts can be seen in terms of human dimensions of natural hazards. The social forces impelling rural–urban migration are in response to a need to improve one's standard of living and to the attraction—the 'pull' factors—of the cities. In the rural areas, the younger generation are now armed with a better education and find farming and other rural occupations unrewarding. There is a tendency for them to move to towns and cities to seek their fortune (Muhammad Razha bin Haji Abdul Rashid 1978). The social forces brought about by housing shortages also reinforce the squatter problem, as there is insufficient low-cost housing for the growing population. Poverty, another social issue confronting the government, is also a force that reinforces squatting.

Political forces also reinforce squatting. First, it has been documented that many political parties have their support at the 'grass roots' level in squatter settlements. Squatting is also reinforced and perpetuated by strong political forces. For example, it has been found that politics and squatting are not only closely linked but in fact depend on one another for survival. On the one hand, politicians need squatters to vote for them, while on the other squatters need politicians to protect them from being evicted, moved or even (in the case of illegal immigrants) deported (Chan et al. 2001). Hence, many political parties have set up branches in squatter areas, ostensibly to help squatters but in reality to further their own ends. Being at the grass roots level, squatters are vulnerable and easy targets for recruit to membership of political parties. And because the relationship is a symbiotic one that benefits both sides, it is not easy to suppress, and in fact is perpetuated for mutual survival. Other than politicians, non-governmental organisations (NGOs), including many politically motivated ones, have also exploited the situation by ostensibly championing the rights of squatters. Again, this has reinforced squatting and perpetuated flood plain occupation.

Based on the above analysis, it is clear that people who squat on flood-prone areas do not do so by choice; they are poor, have no land or house of their own, and/or are illegal immigrants. This is reinforced by socio-economic and political forces which strongly encourage squatting, and thereby the persistent occupation of flood plains and their increasing encroachment. Consequently, given the high squatter population in the country, it can be said that a significant proportion of Malaysians have little choice but to remain on flood plains. In the household survey, respondents who said that 'they had no money', 'they had nowhere to go' and 'it was the same everywhere' are classified as having no choice. A total of 202 respondents (32.7 per cent) in the current research are in this category.

Squatting and River Pollution

The majority of squatter colonies in Malaysia are located on flood plains, mostly lining the banks of rivers, which are the most dangerous flood-prone areas (Chan 2002a). Since squatter colonies have no piped water, rivers are the main source of water supply (mostly for washing as the water quality is generally poor). Keizrul Abdullah (2002) notes that squatters are one of the major polluting agents of rivers discharging a variety of pollutants. Hence, despite the river's built-in self-purification abilities, i.e. it can absorb and cleanse itself wastes and impurities, the mushrooming of squatter colonies along the river has overstressed river. Squatters also live in upstream catchment areas. Degradation of forested upstream areas due to opening up of catchment areas due to squatting and other humans activities have resulted in adverse changes to the hydrology of rivers, including deteriorating river water quantity as well as quality, threatening its ability to support eco-systems. In Malaysia today, the state of rivers is appalling and in many urban areas, rivers have been literally turned into open sewers, some to the extent of being non rehabilitable. Various sources of pollution have been caused by squatters and their activities along of the river banks, ranging from agricultural pollutants (fertilisers, pesticides and sediments from soil erosion), livestock farming (animal wastes), domestic homes (human wastes), and small-scale industries such as motorcycle workshops, carpentry, motorized vehicle workshops and food processing, (industrial effluent). Such pollution already adversely affects river water as well as the river environment. This renders river water unfit for any use. In many squatter areas, organic pollution of water from both point and non-point sources have resulted in environmental problems and adversely affected river water quality and the habitats of aquatic flora and fauna. Rivers face their most severe pollution when they flow through squatter areas as they are subjected to heavy solid and liquid waste disposal from squatter settlements, drainage effluents from illegal workshops, food centres and wet markets, residual hydrocarbon from workshops, and excessive silt loads from land clearings. In the Klang Valley alone, an estimated 80 tons of solid wastes end up in the Sg. Klang daily.

In the last two decades, the influx of migrants from rural areas into cities, as well as the influx of foreigners, has given rise to squatter colonies on river banks. Squatters build haphazard housing with no sanitation facilities. Hence, they dump all their wastewaters and garbage into rivers. Most of the towns and cities in Malaysia (including the Federal Capital of Kuala Lumpur) grew from squatter settlements. Currently, squatter settlements line the banks of all the major rivers in the urban areas, with many colonies such as those along the Sg Pahang built over the river itself. Since river banks are flood-prone, the land is seldom developed. Hence, these areas provide a cheap/free and convenient locale for the poor. In recent years, immigrants from neighbouring countries have literally "flooded" these squatter settlements, just as the settlements themselves are flooded ever so often. Squatter settlements are not provided with sanitation facilities or rubbish disposal facilities. Hence, the squatters use the rivers both as a source of water as well as a means of waste disposal. It is not uncommon to find toilets constructed on stilts in the river. Squatters are also guilty of dumping all sorts of rubbish into rivers, including old furniture and broken down motor-cycles and cars. Along the Sg. Klang alone, it is estimated that about 40,000 families live in squatter settlements. Hence the amount of pollution generated is enormous (WWF Malaysia 2004).

Deforestation and rapid land use change due to accelerated economic growth have destroyed the natural forest cover replacing it with exposed or partly exposed surfaces. In Penang Hill, part of which is a water catchment area, many forested areas have been cleared for orchards and illegal squatter housing. Other activities that have had a similar effect on the land use are mining operations, construction of housing, logging and clearing of forests, highway construction, agriculture estates, quarrying and urbanisation (Chan 1999). All these have caused high concentrations of suspended sediment in downstream stretches of rivers.

Typically, the lower stretches of Malaysian rivers are characterised by heavy silt loads especially after heavy rains (Photo 3). For urban areas, Keizrul Abdullah (2002) demonstrates that 90 % of sediment load in rivers are derived from land cleared for construction. In the Klang Valley alone, it has been estimated that erosion averages 2,950 tons/sq. km/yr for the whole catchment, equivalent to about 3 mm of soil loss a year. In many upstream areas where forest clearance has been rapid, erosion rates of more than 50,000 tons/sq. km/yr are not uncommon (Wan Ruslan Ismail 1995; Chan & Wan Ruslan Ismail 1997). In comparison, the rates of erosion for undisturbed forest catchments are only of the magnitude between 10 to 100 ton/sq. km/yr. Hence, pollution via sedimentation is a serious problems for Malaysia rivers and a major river management issue (Douglas 2002).

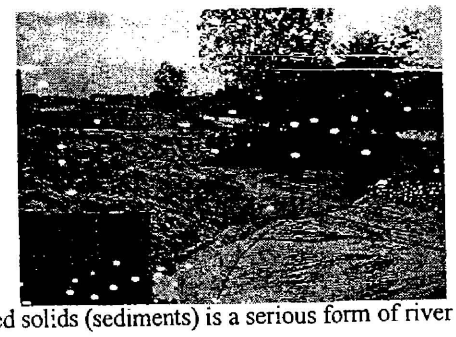

Photo 3. Pollution by suspended solids (sediments) is a serious form of river pollution in Malaysia.

The most serious kind of river pollution, however, is the pollution by heavy metals and hazardous chemicals discharged from the thousands of factories in industrial zones, especially those located upstream of rivers. Privatisation of treatment of industrial wastes has made such treatment expensive, and there are a significant number of factories not treating their wastes. Some have even been caught dumping their wastes illegally. The economic slowdown in recent years has exacerbated this problem, as there are more and more incidents of illegal dumping of toxic wastes and leakages of waste products from improperly constructed containers as well as accidental spillage (Chan 2002b). This has caused serious pollution, especially to the rivers. Based on the current large volume (which is increasing alarmingly) of pollutants of all sorts, rivers can no longer perform their self-purification function. Consequently, river pollution monitoring by the Department of Environment (DOE) has shown a drastic decline in water quality of rivers. For example, out of the 117 rivers monitored in 1997, 24 were rated as clean, 68 slightly polluted and 25 polluted (Keizrul Abdullah 2002). The situation improved slightly in 1998 but the conditions of rivers deteriorated again in 2002. In terms of heavy metal contamination, 55 rivers have been found to exceed the maximum limit of 0.001 mg/l for cadmium, 44 rivers exceeded the iron limit of 1.00 mg/l, 36 rivers exceeded the lead limit of 0.01 mg/l and 24 rivers exceeded the mercury limit of 0.0001 mg/l (Keizrul Abdullah 2002).

CONCLUSIONS

In Malaysia, rural–urban and international migration into cities has resulted in flood plain encroachment. Migrants and other communities persist in living on hazardous flood plains, not usually out of choice. Landlessness has encouraged squatting on hazardous flood zones. This has in turn suppressed living standards as flood losses reduced incomes. Flood plain dwellers therefore remain poor. Poverty has increased vulnerability to flood hazards. Vulnerability is, therefore, largely a function of macro structural/societal forces beyond the individual's control. Such forces are found to impinge upon and strongly influence people's

decision to persist in settling on flood plains. These forces operate at the broadest level and pervade all levels of flood plain squatters' livelihood, contributing significantly to their continued occupation of flood plains. Thus, despite a high level of flood hazard awareness, a high level of pessimism and a high level of expectation of future floods, impoverished flood plain occupants cannot afford to leave for more advantageous locations, but are instead trapped in their present locations. Political and other socio-economic forces also reinforce and perpetuate squatting in flood-prone zones. Squatters, without proper sanitation and garbage disposal, also dump their garbage and wastes into rivers. Hence, squatters are one of the main sources of river pollution. The authorities need to realise that no amount of river cleaning and conservancy will be effective if they do not address the squatter issue. Amongst the possible solutions include low cost housing, relocation, improvement of job opportunities in rural areas, and environmental awareness and education.

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