FLOOD MANAGEMENT IN MALAYSIA

1.0 BACKGROUND

Floods are natural processes. Throughout time they have shaped the landscape, provided habitat for wildlife, and created rich soils. Cumulatively, floods have also been our nation's greatest natural disaster, disrupting lives, and often causing significant economic losses in terms of services and distort the national development planning. Television coverage of floods and their consequences has provided vivid images of the damage that can be done.

Floods happen when runoff exceeds the capacity of the river channel or whenever there is an excess of water overflows onto the nearby low-lying area. But this situation does not occurred if the topography of the ground is higher.

Human activity often leads to flood damage. When people use flood-prone areas to build their homes and businesses, they are exposed to risk. The flood will damage or destroy the facilities and may flood more land.

This paper will outlined some of the problems and techniques in managing flood in Malaysia.

2.0 CAUSES OF FLOODING

2.1 Runoff Quantity issues

Flooding is major issues that need to be addressed. Frequent flash floods in the existing drainage and low-lying areas have caused a lot of inconvenience to the local residents and the public. Floods of greater magnitude have also occurred in river channels during heavy rains, causing floodwaters to overflow through river bunds into low-lying areas behind the bunds. Flood problem has caused much hardship to the population in the affected areas and would continue to worsen as more developments take place upstream.

2.2 Drainage Practice

Present experience indicates that end-of-channel; rapid disposal, localised, reactive and mono-functional drainage concepts have been widely practised in Malaysia. This is a conventional approach to storm water management, which has been reviewed following recent advances in the field in many developed countries. This method of storm runoff disposal is in actual fact transferring whatever problems from development site to downstream areas. Apart from being cost inefficient, it can increase drain sizes, conveyance

distance to receiving waters and calls for unnecessary river or drainage improvement works.

2.3 Insufficient Drainage and River System

Drainage facilities such as drains, culverts and channels. Some of these facilities have long existed since the pre-development days. The facilities are presently inadequate to cope with increased basin runoff as evidenced by the occurrence of flash flood in many areas.

With new developments yet to come, basin runoff will be further increased. Under the current drainage practice (rapid disposal), this will cause local drainage and river channels downstream to be under capacity and more ineffective in their carrying capacity.

Table 1 below show example of inadequate carrying capacity of rivers in Kelantan River Basin.

Table 1: Existing Bankfull Capacity (DID, 1999a).

Location	River Capacity (Cumec)	Dist. From R. Mouth (km)
Kota Bharu	4,500	12
Pasir Mas	6,600	28
Tanah Merah	10,200	59
Guillemard	10,000	65
Kuala Krai	11,000	101

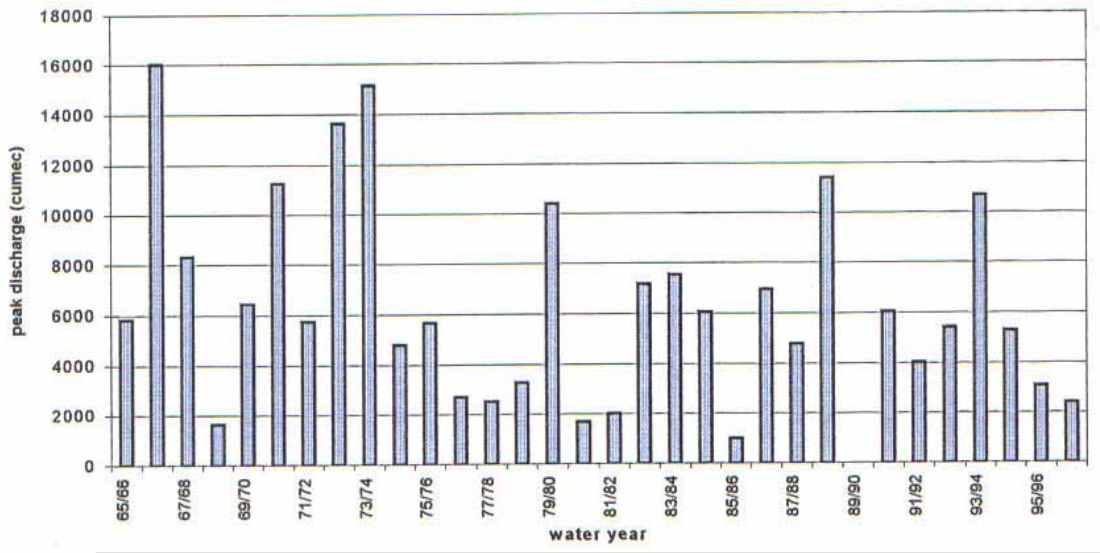


Figure 1: Annual Peak Discharges at Guillemard Bridge, Kelantan River (DID, 1999a).

In many localities, drains and culverts have remained undersized even after developments have been completed. To improve the drainage system to meet the increased basin runoff discharges would take time and require huge investment cost. It is virtually difficult to immediately increase the capacity of existing drains and river geometry to meet such demand.

2.4 Natural Low-lying Areas

Natural low-lying areas are area prone to flooding normally located in low-lying topography and are therefore subject to inundation after heavy rain.

2.5 Poor Maintenance of Facilities and Siltation Problems

Many drains, culverts and floodgates in certain localities are poorly maintained. Erosion and sedimentation problems tend to escalate with development. This reduces the flow capacity of the facilities, which is made worse by garbage and debris dumping that obstructs flow. In some places, floodgates do not function properly; some are damaged by vandalism, and in certain localities, even the gates get stolen.

3.0 FLOOD MANAGEMENT OPTION/STRATEGIES

3.1 Integrated River Basin Management (IRBM)

Management of water resources has traditionally been focused on protecting human health-oriented environmental values. The Integrated River Basin Management is to minimise the impact of development and to strike a balance between social, economic and environmental concerns to achieve sustainable development.

IRBM thus promotes development in environmentally friendly ways by taking the multi-facet considerations such as discharge control at source as well as incorporating traditional structural and non-structural solutions. This equates to minimising changes to as well as improving the hydrological and water quality characteristics of a watercourse, its aquatic habitat, riparian vegetation and overall ecological integrity.

Floodplain management is one of the components in river basin management which is related to flood risk associated with the human occupation of the floodplain for both urban development and agricultural production. That risk is addressed through management decisions that satisfy the social and economic needs of the community, the constraints that flooding imposes and being compatible with the maintenance or enhancement of the natural ecosystems that the floodplain sustains. Floodplains are a resource of immense value. They

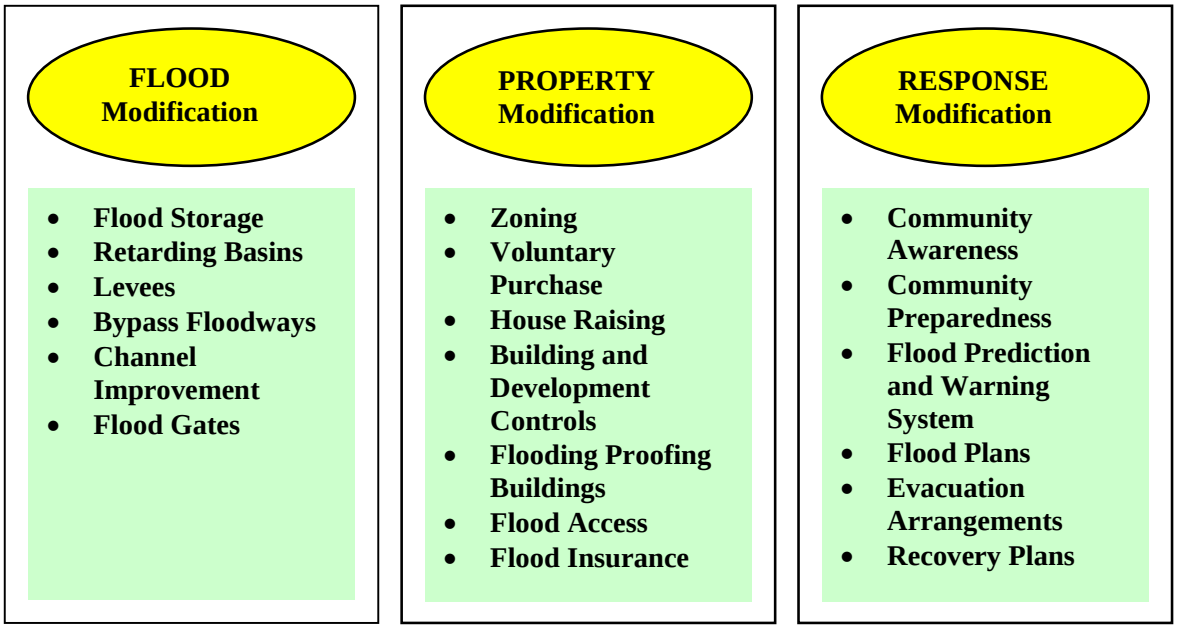
are the sites of most towns and cities and they provide the natural resources to support many productive rural industries. They are areas of primary environmental significance and their well being is essential to the survival of many ecosystems.

In recent times, the significance of floodplain ecosystems has been clearly recognised. Floods are a critical factor in the health of the floodplain itself, the rivers and coastal estuaries. It is now realised that some historical uses of floodplains, and the introduced infrastructure, can interfere markedly with these ecosystems. An integrated approach to floodplain management features not only a consideration of flood characteristics but also a variety of other interrelated issues such as community desires, and the ecological and economic impacts of various land use and flood mitigation measures. In other words, development on flood prone land is considered across the broad spectrum of issues.

Based on these considerations there are three main principles that are applied:

- Recognition that three types of flooding problems affect flood-prone areas: the existing problem, the future problem and the residual problem.
- Recognition that the most effective means of flood management is through the development of a Floodplain Management Plan, of which an essential component is a land use plan for flood-prone areas.
- Recognition of the need to evaluate flooding matters in general, particularly land use and development matters, on **an integrated basis**.

Floodplain Management Principles



Floodplain Management Measures

Emergency planning for floodplains is not a panacea for solving problems of flooding; however, when used in combination with floodplain management planning, it offers the chance to:

- reduce the risk associated with the human occupation of the floodplain; and
- reduce short and long term flood related damages in the floodplain communities.

It is important that responsibilities of planning, coordinating and execution of relief measures be carefully considered and planned well before the occurrence of disaster.

3.2 Stormwater Management

The fundamental purpose of storm drainage systems is to remove excess water that may otherwise collect on the surface of urbanised areas and convey it safely and economically to a river or direct to the sea. Efficient drainage systems help to create an urban environment by conferring the efficient conveyance of stormwater so that the life of a city can proceed without hindrance and safely managed pollutants are discharged without risk to health and environment. The present day planning of stormwater systems has moved significantly away from traditional concrete lined channels to the use of retarding/detention basins to mitigate increased flood peaks due to urbanisation. Grassed floodways have replaced concrete channels to decrease flow velocity and provide greater visual appeal and passive

recreation areas. Additionally attempts have also been made to curb non-point source (NPS) pollution due to litter, sediment, and nutrients, etc. This is achieved through stormwater best management practices (BMPs), such as gross pollutant traps (GPTs), water quality control ponds and grass swales. There is also an increasing awareness of the ecological values of watercourses and the need to maintain and enhance these values.

The control of both the quantity and quality of urban runoff is now being seen to be of major importance in the management of catchments and receiving waters. A different approach to the management of urban stormwater for the study area has involved the following:

- The establishment of a storage-oriented approach for controlling runoff quantity from development sites;
- The identification of the environmental values (or beneficial uses) of particular water bodies, which are to be protected;
- The establishment of objectives which will achieve required levels of flood protection and water quality enhancement; and
- The establishment of water quality management strategies.

The control of stormwater quantity and quality can be undertaken in an integrated manner to minimise the physical and chemical changes to the water environment. There is no single universal solution to managing urban stormwater. A mix of strategies including planning, education, economic instruments, monitoring, public reporting and structural management principles will be needed to address these problems on multiple fronts and reflect the individual characteristics of a catchment and its stormwater management issues. Choosing a mix of strategies particular for a catchment will allow a balanced and cost-effective outcome to be obtained.

4. CONCLUSION

Flooding has been identified as a major influence on the environmental conditions of the receiving waters within certain areas. As a consequence of the impacts, the value of the rivers as an ecological, community and economic resource is under threat. This calls for action by the government and wider community to protect these values and to maintain the quality of life enjoyed by residents.

Urbanisation is known to be significantly impacting on the natural environment as a consequence of increasing runoff peak and volume, accelerated sedimentation, the removal of vegetation filters and increased pollutant loading of waterways. This has led to observable changes in environmental conditions and concerns being expressed by the wider community about the potential long-term consequence of such activity.