

1. Impression of Tone-Ara, Yodo-Neya and Tsurumi Basin

The Tone-Ara, Yodo-Neya and the Tsurumi basins are the more important river basins in Japan and it is from these field trips that I realise the benefits and necessity why the Japanese Government is investing billion of yen in implementing the various basin master plan projects.

The flood plains in these basins are densely populated. Many houses and economic activities are located right in the flood plains. In order to protect such heavy investment by the people the government is duty bound to take flood prevention measure which is costly but is necessary. Huge and high embankments have to be constructed along the rivers to prevent river overspill because with the deprivation of the rivers' natural flood plain, flood water is confined only within the river proper and hence is much high than the ground level. Besides long and high embankments, other structures such as dams, barrages, retention ponds etc. are required to prevent flooding of the basins.

Each basin a master plan which I must say is well thought of multiple high dams are constructed at the upper reaches, some to generate hydroelectric power and others to reduce flood peaks. While along the rivers numerous intakes are constructed for irrigation and water supply. To optimise the use of land, berms along rivers are utilized for recreation facilities and other social amenities like golf course, car parks, boating and other games.

On the whole these basins are well managed indeed. The daily operation and maintenance of the flood prevention structures is well executed as is expected since potential flood loss is high in these basins.

2. (i) Flood Forecasting System

In Malaysia most river basins have some forms of flood forecasting system either by stage correlation method or by using computer flood model.

Warnings are normally disseminated through radio and television broadcasts. Also on site, loud speakers on mobile vehicles are employed.

(ii) Evacuation of Endangered Inhabitants

In my country in flood prone areas, the government has identified suitable evacuation centres for evacuating endangered inhabitants and properties. Transports will be provided by various government agencies and some private enterprises to assist in the evacuation.

(iii) Flood Proofing for Buildings

In Malaysia in flood prone areas, the people normally built their houses on elevation higher than the flood level either by constructing their houses on poles, stilts or piles or by raising the ground with earth fill. Some city dwellers have attempted to flood proof their houses by raising existing or constructing new surrounding high walls around their houses to prevent flood water from entering and damaging their properties. Other methods different from the above are rarely being employed mainly from economic point of view.

(iv) Formation of Flood Fighting Organization

Flood fighting organizations play an important role in minimising the danger of flood especially due to dyke breaches. Early signs of dyke cracks, scouring or overtopping can be detected and immediate remedy can be carried out to prevent further deterioration

In Malaysia formation of flood organisation fighting organisation will not be of much use or effective due to the following reasons;

- (a) The dykes along rivers are usually low (less than 1.5 metres) thus the risk is not that high in case of dyke breaches.
- (b) Where are usually vast areas of rice field, swamps and low agricultural land on one or both sides along the rivers which can retain flood water in the event of dyke breaches.
- (c) Unlike Japan not many people stay along dykes and since very few people's lives and properties will be endangered in the event of dyke breaches, the formation of flood fighting organisation will not be well received and effective.
- (d) High dykes are never used as a flood prevention measure.

(v) Flood Detention Structures in Urban Areas

Flood detention facilities in urban areas should be encouraged as this measure can be considerably effective in reducing flood peak.

(a) Roof-top Storage

If all buildings are made mandatory to have roof-top storage, the effect in reducing flood peak can be considerable. However this measure may not be welcome by the people as to provide storage, roof tops have to be flat and leak-proofed thus increasing capital cost and not only house roof may lose its aesthetic value.

(b) Parking Lot Detention Ponds

There should be no problem in implementing this measure of detention storage. The only problem I can see is the cleaning up of the mud and debris after the release of the detained water.

(c) Detention Ponds

This measure has already been employed in Malaysia.

(d) Infiltration Ponds

To be effective infiltration ponds should be properly designed and constructed. In order to increase infiltration lateral perforated pipes may be used to supply water to adjacent land. A possible way to make infiltration ponds an effective measure is to make it mandatory for new buildings and houses to have their open area or garden so constructed that they must have a sand layer of not less than 300 cm at say 300 cm beneath the top soil layer to act as sponges to detain water and also to allow infiltration. In this way the problem of clogging up as in infiltration ponds can be eliminated.

(vi) Watershed Management

An Malaysia most watershed for important reservoir dams have been gazetted as special watershed area. Once gazetted no other activities are allowed in these areas.

In other watershed especially near urban areas the government impose conditions

like construction of silt traps (similar to sabo works in Japan), planting of cover crops on exposed land etc. as necessary compulsory requirements before any project is approved for implementation.

(vii) Zoning, Land Use Regulation and Comprehensive Basin Development Plan

In Malaysia flood loss is not so high and flood depth is often less than 1.5 meter in most places. It is already a practice that before any housing development or important public building is to be constructed, the plan must first be vetted and processed by a group of relevant government agencies who will then assess its suitability and stipulate conditions as prerequisites if necessary. Proposals to develop in highly flood risk areas are normally rejected or if not very stiff conditions will be imposed. With such government procedure in practice it is felt zoning and land use regulation may not be necessary.

(viii) Utilization of Flood Risk Map for Flood Prevention Plan and Basin Development Plan

The Drainage and Irrigation Department in Malaysia often prepare flood maps for the country almost every year but has yet to produce flood risks maps. At the moment flood maps have been used for planning of development in the basin. In the future flood risk maps should be prepared and be used for flood prevention and basin development plans. There is no problem in using this measure.

(ix) Flood Insurance

As flooding in Malaysia is widespread and shallow and also river flood plains are seldom occupied by houses and high investment, flood damage is usually not high. Also affected population due to flooding is relatively small. For these reasons flood insurance will not be popular and is felt not necessary in Malaysia.

3. Difference of River Utilization and Flood Prevention Measures between Japan and Malaysia

Generally speaking there is no difference between river utilization in Japan and in Malaysia. Like in Japan rivers are utilised to generate hydroelectric power, to provide irrigation water for agricultural activities and water for domestic and industrial use and to a small extent used for navigation of small boats.

As for flood prevention measures there are some difference as below;

- (i) Japanese rivers have smaller catchment area and are shorter and steeper comparatively. At the upper reaches of the rivers employing dams to reduce flood peak may not be so effective. Rivers in Malaysia on the other hand have under valleys and larger catchment areas at the upper reaches and hence dams are usually constructed to reduce flood peaks.
- (ii) In Japan flood plain are densely populated right up to the river banks hence rivers, deprived of their natural flood plains are forced to rise resulting in the construction of high embankments as a mean to prevent flooding. In Malaysia houses are normally constructed on high ground a natural levees or on poles or stilts in flood plains. Seldom are high embankments constructed as a flood prevention measure. To protect agricultural land low embankment may be constructed for certain stretches only. Cities are never protected by high embankments unlike in Japan.

Malaysia might follow Japan in the treatment of rivers in future, especially on the following aspects;

- (a) More dams may have to be constructed to provide hydroelectric power as the country's electricity demand increases due to industrialization.
- (b) As demand for water supply increases, barrages or control weirs may have to be constructed across major rivers at the lower reaches to prevent soft water intrusion and to back up and divert water for water supply.

4. Non-Structural Measures That are Practised in Malaysia which may be useful to Japan

Land Use Regulations and Watershed Management

- (a) Government Land which is steeper than 20% will be kept as government reserves in its natural state and will not be alienated to the people for any activity. In this way to some extent erosion can be reduced.
- (b) In all designated agricultural land only one house is allowed to be constructed in every ½ hectare.
- (c) All land not designated for housing cannot be developed for housing. However the land owner can apply for conversion of his agricultural land to housing to the

State Government if he so requires. His application will then be processed by a group of government agencies who will then be processed by a group of government agencies who will then make comments on the possible consequences of the land being developed for housing. These agencies will also suggest recommendations or stipulate conditions which the developer must follow if his land is to be approved. In this way flood condition in an area will not be worsened due to irresponsible developers.

