

## 2.4 Conclusion

In summary, the main agencies responsible for drainage policy and programme is as listed below. This will include matters pertaining to policy formulation, Funding and Development Programme, Regulations and Guidelines, Drainage Master Plan and Research and Development.

Policy/Programme	Agency
Drainage Policy	National River Council, DID, MHLG (Local Government Department), SWMA, State DID, SPC, State Town Planning Department
Drainage Development Programme	EPU, Treasury, National River Council, DID, MHLG (Local Govt. Dept.)
Regulation / Guidelines	NCLG, DID, MHLG (Local Govt. Depart.), SA, DOE, SWMA
Drainage Master Plan	DID, Local Authority
Research and Development	NAHRIM, University, DID, MHLG (Local Govt. Dept.)

A review of the current capabilities, existing laws and directives suggest that the functional responsibility for the various drainage facilities is as shown in Table VII-2. It is recommended that DID be responsible for all drainage facilities that is connected to the proper management of the drainage basin while facilities necessary at the sub-basin level be the responsibility of the Local Authority. The catchment area criteria could also be used as an additional criteria to assign the responsibility. Generally, facilities having a catchment area of more than 2km<sup>2</sup> and major drainage facilities directly connected with flood mitigation such as river channel improvement, flood retardation basins, weirs and gates, trunk drains and community detention facilities will be the responsibility of DID. The maintenance of these facilities will also be DID except for community detention pond facilities, that is normally incorporated with recreational facilities. As these facilities meet the community recreational needs, they should preferably be maintained by the Local Authority. Drainage facilities constructed at the sub basin level should be managed and maintained by the Local Authority. This will include drainage facilities within the housing development site which is usually built by the Developer to the appropriate technical specifications and eventually surrendered to the Local Authority as a public facility. Storage tanks in new development should be constructed by the developer and maintained by the landowner whereas storage tanks in existing built up areas will be the responsibility of the landowner. Prospects of providing a subsidy for encouraging this facility in existing built up areas should also be explored.

The government budget for drainage improvement is derived from three (3) main sources; namely, the Federal Government, the State Government and the Local Authority, and executed by DID and Local Government. The objectives of their budgetary allocations are, however, not clearly demarcated and hence, the following recommendations are made based

on the functions of the National Rivers Authority and the demarcation of functional responsibility for drainage improvement as mentioned above.

As proposed above, the Local Authority, which is one of the principal implementing agencies for drainage improvement, should shoulder the cost of maintenance of sub-basin drainage facilities using the budgetary share from the Local Authority. On the other hand, DID is to undertake, as another principal implementing agency for drainage improvement, the construction and maintenance of major drainage facilities that include river channel improvement, trunk drains and community ponds. Accordingly, DID will shoulder most of the necessary urban drainage improvement cost.

The budget of DID for drainage improvement come from either the Federal or the State Government according to the burden of expenditure as stated in Article 82 of the Federal Constitution. If the expenditure results from a Federal Commitment in accordance with the Federal Policy and with the approval of the Federal Government, the expenditure should be under the allocation from the Federal Government. Otherwise, the burden is covered under the allocation from the State Government.

Under the current setup, Federal Commitments are made by EPU and the Treasury., where there are difficulties in securing the consistency of Commitment due to lack of the clear demarcation of the functional responsibility for drainage improvement and inadequacy of the interagency coordination. In this connection, if the proposed demarcation of functional responsibility is adopted, the consistency of Commitments is again ensured and the definition of budgetary allocations from the Federal Government is thus facilitated. Moreover, the proposed interstate coordination body, i.e., the National Rivers Council, could be the appropriate platform to address the budgetary allocations from the Federal source before the allocation is forwarded to EPU and the Treasury.

Other main recommendations made under this section are:

- Federal DID and MHLG should play proactive role on policy matters at Federal Level.
- The proposed National Rivers Council should be the most appropriate forum at the Federal Level for the deliberation of policy, strategy and programmes on urban drainage
- It is recommended to strengthen the Urban Drainage Division of DID (HQ) and establish the Urban Drainage Unit in Local Government Department (MHLG).
- Director of State DID should be a permanent member of the SPC
- Long term program on the integrated urban drainage plans should be formulated in tandem with local plans.

- Capacity building and training of drainage engineers should be made on Storm Water Management
- Local Authority of municipal status should have a Drainage Division within the Engineering Department.
- Urban drainage By-laws under the SDBA is required.
- Public awareness and education should be promoted by DID and Local Authority
- Local Authority should play more active role in ERM relating to urban flooding
- Every state should set up a Rivers / Waters Management Authority.
- DOE standards / regulations on the quality of storm water runoff are required.
- It is necessary to establish branch offices of DOE in every district.

### **3. URBAN DRAINAGE AND LAND DEVELOPMENT PROCESS**

The planning of how storm water runoff is to be managed is an important component of the urban planning process. Obviously there is a need for sufficient rules, guidelines and operational manuals to be in place for effective integration of urban drainage in urban planning. In this country physical planning is applied at four levels of plans, that is: (a) Structure Plans, (b) Local Plans, (c) Layout Plans, and (d) Building and Infrastructure Plans. Details of these four levels of plans are as described as below:

#### **3.1 Structure Plan Level**

These are strategic planning documents outlining the long-term development strategies (usually 20 year plan period) for the area. It includes policies and proposals for the development and use of land including measures for the improvement of the physical environment. At a strategic planning level decisions have to be made on issues such as:

- (a) How is storm water runoff to be integrated with overall water service and catchment management plans
- (b) What are the changes to peak discharges and the duration of the runoff? How can adverse impacts be reduced?
- (c) What are the effects of differing land use on the water quality and how can adverse effects be minimized? (e.g. Wetlands, Gross pollutant traps, retention basins etc)
- (d) Identification of important water courses and flow paths worthy of retention

- (e) Extent of reserves necessary for flood retardation and opportunities for multi use management.
- (f) What are the erosion and sediment impacts and the measures to manage them.

### **3.2 Local Plans**

These are more detailed plans outlining policies and proposals for the development, conservation and use of land. These plans are prepared on a survey base and generally depict the proposed land use and intensity of development in the area. Several of the issues discussed above will have to be reviewed at greater detail at the local plan level. At a planning level wherever possible policies should promote:

- (a) Minimization of hardscape areas in order to reduce volume of runoff to the drainage system.
- (b) There should be breaks in the impervious areas in the form of landscaping and permeable surface to allow storm water infiltration.
- (c) Rooftops should drain in part or entirely into landscape areas that are able to absorb such runoff.
- (d) Parking areas should drain into vegetative and grassy swales.
- (e) Grading which result in steeper slopes should be minimized.
- (f) Adequate reserve for river channels and trunk drain reserves could be identified
- (g) Suitable sites for community and regional detention facilities should be established.

### **3.3 Layout Plans**

Layout plans at suitable scales are submitted as part of the land development process in order to obtain planning permission from the local authority. The land development process for conversion and subdivision is shown in Figure VII-4. Most land development for housing schemes follows the conversion and subdivision process (s124 and s136 National Land Code) or the Surrender and Realienation process (s 204A NLC). Different states have adopted different procedures for the land development process. Some States like Kedah, approval to layout plans is done prior to conversion applications whereas in Selangor and Melaka, applications are first made to the Land office for conversion before layout plan approval. The

land development process generally involves three stages, that is, (a) Conversion Approval, (b) Layout Plan Approval, and (c) Subdivision Approval

Conversion applications are made to the respective land office and the plans are sent to relevant technical departments for comments. The key departments consulted at this stage is the Town and Country Planning Department, the Local Authority, JKR, DID and the Land office. The application has to conform to the Structure and Local Plans for the area. The approving authority is the State EXCO which may generally impose development conditions generally with respect to the proportion of housing types, low cost housing quotas and proportion to be sold to Bumiputras. The SA will also impose Conversion Premium and drainage contributions. As conversion of land involves changes to land use status, there will be significant impacts on the amount of storm water runoff. Hence it is crucial that all applications for conversion are also referred to the DID.

Once the approval in principle or conversion approval is obtained, the developer then submits detail layout plans. It is at this stage of planning that land allocations for drainage facilities are demarcated. The layout plan has to comply with section 21A (Development Proposal Report), s21B (Layout Plan) and s21C (submission by qualified persons) of the TCPA. The development proposal report or the LCP has to provide a full description of the land including the topography, drainage, waterbodies and catchment areas. These layout plans are sent to relevant technical departments for their comments. All relevant technical guidelines are applied as conditions to layout approval. In essence the layout plan has to demonstrate that satisfactory storm water management measures are incorporated into the plan. The layout plan is usually approved and adopted by the Local Authority of the area. Rights of way for drainage and erosion control facilities and flood control facilities are surrendered as public facility to be maintained by the local authority.

Once the layout plan is approved, the developer makes an application to the Land Office for the approval of the subdivision plan. The subdivision plan has to comply with the approved layout plan and the conditions of s136 NLC.

### **3.4 Building and Infrastructure Plan Submission and Approval**

The next steps after the land development process is to apply for building and infrastructure plan approval. Building Layout Plans are submitted to the Local Authorities. Planning permission or development order must first be obtained before detail building plans are submitted. It is at this stage of application that new guidelines on rainwater tanks and storm water storage tanks could be imposed. Application for planning permission/ Development

Order from the Local authority has to be supported by a Development proposal report (LCP). Building plans are prepared by a qualified architect while plans related to urban drainage and other infrastructure works are prepared by a professional engineer. The process flowchart for building plan approval is shown in Figure VII-5. These approvals must be obtained before actual implementation can take place.

Since there are several levels of plan making, it is important that appropriate guidelines on integrated urban drainage are applied at different levels.

#### **4. FUNDING AND COST RECOVERY METHODS**

##### **4.1 Source of Funding for Drainage Infrastructure Projects**

Sources of funding for Drainage Infrastructure projects are as follows:

- (a) Federal and State Development Funds
- (b) State Road Grants
- (c) Development cost met by Developers
- (d) Drainage Contribution (NLC)
- (e) Drainage Improvement Rates ( SDBA)
- (f) Drainage Rates (LGA)
- (g) Subsidy

The details of the above funding sources are as described below:

##### **(1) Federal and State Development Funds**

Federal and State Development Funds are the most common sources of funds for drainage projects. Federal Funds are sourced from the Federal Treasury and may be initiated by the Local Authority, State DID or the Federal DID. These funds cover master planning studies, as well as design and construction of facilities. These projects are budgeted as part of the 5 year Malaysia Plans and taken under the heading of Drainage and Flood Mitigation in Urban Areas and River Management projects in the case of Federal DID projects.

##### **(2) State Road Grants**

These are annual grants provided by the Federal to the state governments. These grants are to cover maintenance cost of State Roads and other roads that meet the required qualification. This budget is usually administered by the State JKR and also includes maintenance of roadside drains and culverts.

(3) Drainage Infrastructure Cost met by Developers

The local authority by law may require developers to construct connecting drains and other storm water detention facilities within development areas. There have also been instances where developers have been required to improve drainage channels outside their development areas. These requirements are imposed as conditions for development approval and in most cases complied by the developers. The developers normally construct the facilities and then hand them over to the Local Authority which then has the responsibility to maintain them.

(4) Drainage Contribution

Drainage contributions are imposed on developers of land as part of the land conversion process (s124 (5) National Land Code). The reason for imposing such charges is that the land development will contribute to increased runoff thereby adversely affecting the drainage capacity of the rivers and connected drainage channels. Charges usually from RM7,000 to RM10,000 per hectare. The highest rate charged is Penang where it is RM25,000/ha while the lowest is Kedah with RM2,500/ha. Most states impose the rate based on the total development area. Some impose the charges based on the type of development (Kedah). The collection system also varies, for example, in Selangor the collection is done by DID whereas in Kedah it is collected by the Local Authority and in some other states it is collected by the Land Office (refer to Table VII-3). In order to streamline these differences, the MHLG has suggested that the rates be standardized to RM10,000/ha for Municipal Council areas and RM7500/ha for District Council and rural areas. It should be noted however that these charges are insufficient to meet the huge capital investments needed for drainage projects, nevertheless they are an important source of revenue to the State. These charges are normally aggregated into the State Consolidated Fund. Major portions of these funds are disbursed for drainage projects in the State. The new focus on urban drainage advocates source control such as detention ponds which would invariably reduce peak discharge into the river systems. As such some developers argue that this charge should be lifted or reduced in the future. Notwithstanding this it has been reported in this study the drainage capacities in many of our rivers are low and as such improvement works on rivers will still have to be carried out in the future.

(5) Drainage Improvement Charges

Drainage Improvement charges imposed by Local Authorities are of two types:

- (a) Specific drainage improvements undertaken by the Local Authority (s51SDBA) where the charge is imposed on the frontagers.
- (b) The Local Authority may also impose this charge on any developer (not necessarily the frontagers) with the approval of the State, if his development is likely to adversely affect any existing drainage infrastructure in the area.

There are a number of local authorities that have imposed these charges based on the latter such as the City of Ipoh and the Municipality of Melaka. Unlike the drainage contribution, these charges are collected by the Local Authority and consolidated into the Improvement Services Fund (s132 SDBA) or the Local Authority Fund (s40 LGA). Charges under s51SDBA are only imposed on frontagers and developers. However it should be noted that drainage improvement works tend to benefit all property owners within the drainage area and not merely frontagers. As such it is suggested that the provisions of the section should apply to all landowners in the drainage area and not only frontagers. This concept is similar to that outlined in the Drainage Works Ordinance 1954. This means there is a need to first:

- (a) Designate the affected area.
- (b) The criteria to be applied for the levy is spelled out in s51(4) SDBA
  - Area of the respective premise
  - The use the respective premise will be put
  - The condition of the land, before, during and completion of development
  - The degree of benefit to be derived from the improvement works
  - Any improvement works done by the affected party or developer
  - Cost of premises surrendered by the owners to the Local Authority
  - Any other relevant matters
- (c) It should be noted that under this provision the amount to be levied is to defray the cost of construction of the facility and does not cover maintenance costs.



While drainage contributions are collected by the State Authority, drainage improvement charges are imposed and collected by Local Authorities. The charges may be prospective (i.e. charged on developers) or to recoup investments spend on drainage improvement works (i.e. charged on frontagers).

(6) Drainage Rates

The local authority may also impose Drainage rates to meet the cost of construction of any drainage system (s132 Local Governments Act 1976). These rates will be based on a percentage of the annual value of the holding or the improved value of the holding. The maximum rate imposed is 5% of the annual value or 1% of the improved value. Most local authorities have not imposed these charges on ratepayers. However with increased responsibility for providing and maintaining drainage systems including retention ponds, it may be incumbent on local authorities to impose these rates to ensure a revenue stream for such works.

(7) Subsidy

Storage tanks have been successfully applied in Japan as a detention facility in existing built up areas. While storage tanks may be imposed as a condition for building plan approval, it may be difficult to impose this requirement on existing premises. Hence some form of subsidy may be needed to encourage existing property owners to install the facility. Detention storage tanks may be incorporated with the rainwater collection tanks which are promoted by the Ministry of Housing (MHLG). Research in Japan has shown that subsidy provided by the Ministry of Construction for storage tanks offsets the more expensive option of providing wider drains, rivers and detention facilities.

#### 4.2 Source of Funding for Maintenance

Maintenance of Drainage Facilities is an important function that is carried out by the facility provider. In the case of river improvement works and trunk drains constructed by DID, the facility is also maintained by DID. Roadside drains along Federal and State roads are maintained by JKR while all other drainage facilities are maintained by the Local Authority. The Ministry of Housing and Local Government has establish guidelines on the maintenance of drainage facilities in Local Authority areas:

- (a) Local Authority should set aside an annual budget for maintenance

- (b) There should be co-ordination in the maintenance programme of JKR, DID and the Local Authority.
- (d) Local Authority should strive to build better quality drainage infrastructure including modern runoff conveyances such as swales
- (e) Compliance with a maintenance and data record
- (f) Monitoring of Maintenance and Cleaning Contractors
- (g) Promote Public Awareness Campaigns and public education programmes
- (h) Undertake community programmes on cleanliness (Kempen Bersih dan Indah bersama Rakyat)
- (i) Comply with a prescribed maintenance schedule as listed in Table VII-4.

### **4.3. Conclusion**

An overview of the functional responsibility for the provision of drainage facility and possible cost recovery measures are shown in Table VII-5. Most works connected with river flood mitigation will continue to be met by Federal and State development grants. Drainage contributions collected by the State may provide the some government cost recovering measures for such works. Drainage Facilities in land development sites will continue to be provided by Developers however the facility will have to be maintained by the Local Authority. It is envisaged Storage Facilities in open spaces will have to be built and maintained by Local Authority. While initial capital outlay may be obtained from the Federal or State grants, it is necessary for Local Authority to exercise their powers under the SDBA and the LGA and impose Drainage Improvement Charges and Drainage rates as a source of revenue stream for the Local Authority.

## **5. ENFORCEMENT CAPACITY**

### **5.1 Main Offences Related to Urban Drainage and Enforcement Responsibility**

Enforcement is related to the legislation on urban drainage. A review of the legislation relating to urban drainage was discussed in Volume 3. A summary of the related legislation and the implementing agency related to urban drainage is shown in Table VII-6.

A review of current laws suggests that rivers and drains come within the purview of the State. Hence it is not surprising that the enforcement of these legislations lies mainly with Land

Administrator, Local Authority and the DOE on environmental protection matters. However many of these agencies lack enforcement personnel and adequate bylaws, standards and rules that could be enforced. The main offences related to urban drainage and the enforcement responsibility are discussed below:

(1) Land Use Violation

Land use violation with respect to breach of conditions relating to land use conversion and subdivision are enforced by the Land Administrator using the powers conferred by the National Land Code. However under the TCPA, the Local Planning Authority has wide powers to ensure that no development commences without planning permission. It is the duty of the LPA to ensure that development within the Local Authority area conforms to the Structure and Local Plans for the area. It has also sufficient powers to ensure that all development conforms to the approved layout plan.

(2) Litter and Unauthorized Garbage Disposal

Garbage and solid waste are one of the main pollutants of storm water in the country. These garbage clogs drains often causing flash floods, reduces the visual amenity and causes stench. Most Local Authorities have bylaws under the Local Government Act to prevent littering and depositing of waste and filth and prevent the occurrence of any nuisance in any drain or waterway. Enforcement however is difficult as litter is a non-point source pollutant and may originate from washouts from the highways and roads or from the several squatter settlements that occupy the river reserves. The lack of public awareness and indifference to the drains further aggravates the problem. In addition to structural measures such as GPT (Gross pollutant traps), it is absolutely essential for Local Authority to undertake public awareness campaigns and public education programmes.

(3) Erosion of Hill Land

Protection of hill lands is provided in the Land Conservation Act 1960. Once gazetted there are prohibitions on short-term crops and clearing of hill land without a permit. However very few hill lands have been gazetted under this law. Enforcement power under this Act is with the Land Administrator who has serious limitations on enforcement personnel. There are also existing Guidelines on Hillside Development which is promoted by the Ministry of Housing and Local Government. These guidelines have to be observed in preparing development plans for the area. There are

also current proposals to incorporate hilly areas within Streets Drainage Building Act which then puts the mandate on the Local Authority to enforce these guidelines

(4) Control of Earthworks

The control of earthworks are provided in the Earthworks bylaws which are promulgated under s70 (A) SDBA. Under this bylaws, the powers are given to the Local Authority to control earthworks to prevent soil erosion, disturbance and pollution. Under the bylaws there is a need to provide for drainage facilities and adequate silt traps in all land development schemes. The DOE has also prepared Guidelines on the Prevention and Control of Soil Erosion and Siltation. These guidelines are applied in establishing the Erosion and sediment control plan (ESCP) which is part of the Environmental Management Plan. The EMP is required by DOE for major development projects that require an EIA to be carried out. The enforcement of the ESCP is often lacking due to the lack of DOE offices at the District level. There is also a need to incorporate the ESCP as part of the Earthworks bylaws so that effective supervision may be carried out by the Local Authority.

(5) Diversion and Abstraction of Water, Pollution of Rivers and Damage of Riverbanks

The Waters Act 1920 revised 1989 provides wide powers for the control of rivers and streams. The Act applies in Negeri Sembilan, Pahang, Perak, Malacca, Penang and the Federal Territory. Extensive powers on the conservancy of rivers and water bodies are given to the District Office under the Waters Act 1920. Again the enforcement capacity of the District Office is limited. In Selangor, the Waters Act has been repealed and replaced with the Selangor Waters Management Authority Enactment 1999. This a more comprehensive legislation and provides greater powers of control over the management and control of all waters including river basins, water bodies, ground water, coastal waters and wetlands. The Director appointed by the SWMA is given extensive powers of enforcement. This includes powers to enter and search, power to require attendance of witnesses, power to compound offences, power for the recovery of costs and expenses, powers to arrest and powers to prosecute with the consent of the Public Prosecutor. The SWMA is seen as a forerunner to the establishment of similar water authorities in other states.

(6) Sand Mining Operations

Permits for sand mining operations, removal and transportation of rock material is issued by the District Land Administrator under s70 NLC. Very often such operations

are conducted close to rivers and waterways resulting in badly silted rivers and drains. Very often there is again a lack of enforcement on the conditions of the permit. Under the SWMAE, the Land Administrator has to consult the SWMA before it may issue a permit for the extraction of rock material. Similarly it is suggested that the Local Authority should also be consulted if such operations are within local authority area. The Local Authority should also be empowered to monitor the operations especially if the operation is close to any water body.

(7) Mining Operations

Mining operations for the extraction of metals such as gold and tin are governed by the Mining Enactment 1929. The enactment prohibits the operations from interfering with the riverbanks and a license is needed to discharge water into any watercourse. The discharge water should be free of hazardous chemicals and excessive solid matter. As tin mining is a sunset industry, pollution from such operations may be isolated, albeit an important consideration in areas of active mines. The enforcement responsibility under the Enactment is with the Director of Lands and Mines and the Inspector of Mines. Again there is an absence of standards on the discharge water. Current EIA requirements on mining operations only cover new mining areas of more than 250ha and ore processing and sand dredging works involving an area of more than 50ha.

(8) Discharge of Wastewater

The DOE is also given extensive powers of enforcement with respect to the quality of wastewater discharge. Under s25 EQA, there is prohibition on the discharge of any waste into any inland water, rivers, drains or lakes in contravention of acceptable standards unless licensed. Discharge standards in the form of regulations are available for discharge from palm oil refineries and rubber factories. The Environmental Quality (Sewerage and Industrial Effluents) Regulations 1979 regulates discharge from Sewerage Treatment Plants and the industrial sector. DOE also licenses prescribed premises so as to monitor discharges. Monitoring works are currently being done for major rivers. Monitoring of discharge from Sewerage Treatment Plants (STP) is also carried out by IWK. There are however no monitoring being done for existing drainage channels, detention ponds or constructed wetlands. This may be an important activity in the future, as storm water pollutants are a serious threat to the environment in particular to fish and bird. In the United States, storm water pollution is responsible for as much as 80% of the pollution of the waterways. Pollutants in

storm water include rubbish, sediments, pesticides, trace metals, oil, grease and bacteria. Currently most control devices remove solid particulate using GPT and sediment traps. Other qualitative control measures could include vegetative filter zones, infiltration trenches, wetlands, bio-filtration, swales and oil separators. There should be greater concern on the quality of storm water runoff and there is a need for effective standards and guidelines on BMP (Best management Practices) on storm water management. There are currently being addressed in the Manual. The present enforcement capacity of DOE is also severely limited due to lack of regulations and personnel at the local level. Besides DOE, SWMA may in consultation with DOE prescribe acceptable conditions for the discharge of waste in water sources. However again due to lack of personnel and effective standards, enforcement capacities are rather reduced.

(9) **Unlicensed Blockages and Diversion**

There are a number of laws that prohibit unauthorized blockages and diversion of waters. These include the SDBA, the Waters Act, and the SWMAE. There are also current proposals to amend the SDBA to make it an offence for any person who obstructs the free flow of water in any drain or gutter. The Local Authority is responsible for the maintenance and the closing of any surface or storm water drains (s53SDBA) and also to ensure that all such drains are properly cleaned (s54 SDBA). The enforcement of these offences will be on the Local Authority.

(10) **Indiscriminate Development in Catchment Areas**

Most of the water catchment areas are found in the upstream of towns and cities. In some States they are outside the Local Authority Boundary. Control of development in these areas were governed by the Forestry Act, the Land Conservation Act, the Waters Act and Wildlife Enactment. However again the enforcement of these acts are fraught with difficulties. None of these Acts call for comprehensive management plans for the catchment areas. Several of the forest areas in the catchment areas are not gazetted reserves. It is also difficult to enforce conditions of logging permits within these areas due to remoteness of the areas. Current EIA requirements only apply the housing development greater than 50 ha or for logging areas more than 500ha further reducing the opportunity for environmental guidelines to be applied to the areas. Hence there is an urgent need to designate water catchment areas, prepare management plans for these areas and incorporate them in the Statutory Development Plans i.e. Structure and Local Plans. This is provided for in the SWMAE 1999.

Failure to do this may lead to severe pollution and increased sedimentation in the downstream areas.

(11) Enforcement of River and Drain Reserves

In many Malaysian cities, river reserves have not been properly demarcated. There are several instances where lands adjoining the riverbanks have been alienated. In many instances even buildings have been approved on the riverbanks. Under the Waters Act 1920, no buildings are to be permitted within 50 feet of the riverbanks. In Selangor, under the SWMAE, the required buffer restriction on the construction of any revetments or buildings is increased to 50m of any riverbank. Under the law, the State Authority has the powers to designate river and drain reserves. Current DID guidelines on river reserve recommends a minimum of 15 m in urban areas. Designation of river reserves on alienated land may result in costly land compensation. In practice therefore, river and drain reserves are secured when the land is developed. The reserves have to be shown in the layout plan and surrendered as public land. However there is a need to gazette these reserves under s62 NLC and designate DID or other relevant agency as the controlling officer for the reserve. Lands which are surrendered but not reserved, will become State Land. The Local Authority should ensure that all land surrendered for public purpose is reserved for the purpose it was intended.

(12) Enforcement of Detention Pond Facilities on Residential Development

The current guideline on detention pond facilities is applied for land development in excess of 10ha. The total area set aside for the pond facility in this respect is usually between 3-5 % of the total area. This guideline is applied as a condition to layout plan approval and is not governed by any specific regulation. Unscrupulous developers have avoided providing detention pond facilities by parceling their lands into smaller areas. At the same time it is acknowledged that having too many ponds may cause a deterioration of aesthetics and increased maintenance cost. For areas smaller than the recommended minimum area, it is suggested that developers demonstrate that they have adopted satisfactory BMP (Best Management Practices) on storm water management using other storage and infiltration devices. When they are widely accepted, it is suggested that these guidelines and discharge standards are codified into a Uniform Drainage Bylaw under the SDBA 1974. The enforcement of this requirement on new land development lies with the Local Authority.

(13) Enforcement of Community Detention Pond Facilities

Community Detention Pond facilities should be identified at the Drainage Master Plan stage and incorporated into the Statutory Local Plans of the area. Community detention ponds should be planned for multi use purposes or as a recreational facility. Once the large-scale facility is built, the smaller detention ponds could be discontinued and the land converted for urban development. The construction of this facility could be undertaken by DID under the Flood Mitigation programme or built by Local Authorities as part of their drainage improvement projects.

## **5.2 Conclusion**

In conclusion, the enforcement capacities of local agencies responsible for the provision and quality of urban drainage and storm water are lacking. It is felt that Local Authorities which have sufficient powers under the TCPA, SDBA and the LGA should be entrusted with the responsibility of being the custodian of all waterways including drains and rivers in the Local Authority Area. In this respect it should be the responsibility of Local Authority to co-ordinate with all the relevant agencies on the provision of drainage infrastructure and their maintenance thereof. Local Authority should also have an important role in the promotion of stakeholder participation in the provision of drainage infrastructure in their areas. This includes enhanced community participation and promoting better education programmes to the public in line with the Local Agenda 21 programme. At the same time it is necessary that adequate bylaws, regulations, guidelines and standards are in place not only on the integrated concept of urban drainage provision but also on the quality of storm water runoff. In this respect it is necessary that branch offices of the DOE are established in every district to enhance enforcement capacity of the quality of storm water runoff. A summary of the enabling laws and the enforcement agency for various offences/violations relating to urban drainage is shown in Table VII-7.