CHAPTER 8

LEGISLATION AND INSTITUTIONAL STUDIES

8.0 LEGISLATION AND INSTITUTIONAL STUDIES

8.1 LEGISLATION STUDY

8.1.1 Introduction

8.1.1.1 To ensure that the water quality in the Putrajaya Lake can be achieved and maintained there is a need to identify and review the existing legislation, involving catchment management issues, to ensure that they are adequate. Based on the review there may be a need to recommend appropriate amendments to the existing legislation or propose new legislation to address any ambiguities or inadequacies, respectively, in the existing legislation.

8.1.1.2 The adequacy of the legislative controls covering the following areas in the Putrajaya Lake catchment will have to be reviewed.

- Putrajaya Lake System
- Putrajaya Area
- Catchment areas outside the Putrajaya Area

8.1.1.3 The review and adequacy of the legislative controls covering the Putrajaya Lake System is the subject of another Study. It is expected that adequate legal measures will be taken in that Study to address issues pertaining to the sustainable management of the Lake.

8.1.1.4 The management of the catchment area within the Putrajaya Area will be within the control of the Perbadanan Putrajaya and is most probably not an issue. Thus, the focus of the review of the existing legislation will be concentrated largely on the legal issues pertaining to the management of the catchment areas outside of the Putrajaya Area.

8.1.2 Background review

8.1.2.1 The integrated management of the Lake and its catchment is essential to ensure that the Putrajaya development achieves the objective of being a "City in a Garden". The waterfront of the Lake is about 30 km long and adjoins various land uses proposed under the Master Plan. Several minor rivers drain into the Lake of which the main river is the Sungai Chuau. These rivers are tributaries of the Sungai Langat and are part of the larger Langat River Basin. The rapid pace of urbanisation within Putrajaya and in the surrounding areas of Putrajaya will cause immense pressures

on the Authorities in terms of managing the conflicting demands between rapid development and maintaining the desired level of water quality in the Lake.

8.1.2.2 The catchment areas outside Putrajaya fall within the jurisdiction of the Sepang and Subang Jaya Local Councils, both of which lie in the State of Selangor. It is critical that land use in the catchment area is regulated to protect the quality of water flowing into the Lake, to preserve the aquatic habitats and generally to enhance the waterfront environment.

8.1.2.3 In Selangor the statutory framework for the management of waters has been consolidated in the *Selangor Waters Management Authority Enactment 1999 (SWMAE)*. The Selangor Waters Management Authority (SWMA) to be set up under the SWMAE is required to take a multi sectoral and multidisciplinary approach to the management of water resources with controls over pollution, drainage, adjoining lands and catchments.

8.1.2.4 The integrated management of water resources in general and of large water bodies is something new in this country. The adoption by Malaysia of the Ramsar Convention and the designation of Tasik Bera as a wetland site under the Convention is a relatively new initiative but there is certainly an increasing awareness of the need to manage water resources in a much more integrated and holistic manner.

8.1.2.5 The Lake itself is intended to be an integral part of the Putrajaya community. It will be available for the activities of the community. The types of activities that are likely to be allowed in the Lake include fishing, boating (both motorised and non-motorised), floating restaurants, eco-tourism, swimming, construction of floating and fixed structures, and other activities on and along the waterfront. Activities requiring primary contact with the Lake waters imply that the quality of water in the Lake has to be high. This in turn will translate into requirements to be imposed on the quality of waters that will flow from the catchment areas into the Lake and the attendant constraints or restrictions that may have to be considered in undertaking any development or activity that impacts on such flows.

8.1.2.6 Two critical problems that afflict most waterways in the country are silt due to soil erosion and pollution caused by solid and industrial wastes. It is to be expected that these two problems will also be critical to maintaining the water quality in the Lake.

8.1.3 The Status of Perbadanan Putrajaya

8.1.3.1 The creation of the Federal Administrative Capital of Putrajaya was concluded by way of an Agreement between the Federal Government and the State Government of Selangor (hereafter referred to as the "Agreement"). The Agreement delineates the powers of Putrajaya, which essentially includes all powers over local government and to act as the Land Administrator as enumerated in the Second Schedule of the Agreement. Notwithstanding the latter devolution of powers, Article 3, Clause 3(1) and the Third Schedule of the Agreement identifies certain matters that will remain under the jurisdiction of the State. This includes item 7 – *"water and water supply and the revenue collected therefrom."*

8.1.3.2 The term "water supply and the revenues collected therefrom" refers to the supply of treated water. The term "water" is not defined in the Agreement. It could be broadly interpreted to mean the general regulation and control of water in any source including rivers, water bodies and ground water. In so far as matters pertaining to water outside Putrajaya the State has the sole jurisdiction. In so far as "water" within Putrajaya is concerned the matter is a bit more complex and will be discussed in detail in a later part of this Report.

8.1.3.3 The Perbadanan was established as a body corporate by an act of Parliament (Perbadanan Putrajaya Act, 1995) (PPA) with effect from 1996. The Act gave effect to the provisions of the Agreement and in particular placed the Putrajaya area under the sole jurisdiction and control of the Perbadanan. The main objective of the Perbadanan is to "administer and manage" the Putrajaya area. Its detailed duties include the performance of all functions of a local government in the Putrajaya area. Through subsidiary legislation made by the State the powers of a local government has been bestowed on the Perbadanan.

8.1.3.4 The Perbadanan has full powers to implement the provisions of the PPA. The State Authority may further assign certain powers of the State Authority to the Perbadanan. Accordingly, by way of orders

made under the Putrajaya (Performance of Functions) Enactment 1995 the State of Selangor has assigned its powers and functions under the Street, Drainage and Building Act, 1974 (SDBA), Town and Country Planning Act, 1976 (TCPA) and Local Government Act, 1976 (LGA), in so far as the latter legislation apply to Putrajaya, to the Minister (who in this case is the Prime Minister) and the Perbadanan. It has also appointed a Land Administrator in Perbadanan under the National Land Code to undertake administration of land within Putrajaya.

8.1.4 Review of Laws on Catchment Management

8.1.4.1 Introduction

(1) In addressing issues related to catchment management one has to look at laws relating to the following issues within the catchment area:

(a) water which includes rivers, groundwater, lakes, wetlands and other water bodies;
(b) land and the development/exploitation of such land;
(c) municipal administration which is under the authority of the State Authority/local government; and
(d) environmental management.

(2) Other issues such as state/federal/local authority relationships, constitutional jurisdictions and the rights and participation of stakeholders will also be given due consideration.

8.1.4.2 Constitutional Position - Federal/State Jurisdiction

(1) The constitutional position between the Federal and State authorities related to the following issues are discussed below:

- Water
- Land
- Municipal Administration
- Environmental Management

(a) <u>Water</u>

(2) A detailed review of the position of the Federal Government vis-à-vis the State Governments on water has been undertaken elsewhere (Kerajaan Negeri Selangor, 1998) and need not be repeated here. It may be stated that, in general, "water" is a State matter. This would include rivers, lakes, streams, and

water beneath the surface of the land. However water is not exclusively a matter within the sole jurisdiction of the States. The Federal Government has specific powers, for example over federal works including water supplies, rivers and canals, except those which are wholly within one State or are regulated by an agreement between the States concerned. The Federal Government has control over other aspects of water resource utilisation such as hydropower generation, navigation within ports, marine fisheries and mining.

(3) Parliament has powers to make laws with respect to any matter in the State List for the purpose of promoting uniformity of the laws of two or more States. The power to make such laws, however, is subject to restrictions. *Article 78* of the Constitution stipulates that any law made by Parliament that restricts the right of a State to the use of any river wholly within that State, shall not have effect unless it is approved by the State Legislature. Water rates are also deemed to be a source of revenue to the States. Further, the Federal Government cannot exercise executive authority over matters within the Concurrent List unless the Federal or State laws specifically provide for it. Thus, whilst the Federal Government may legislate for uniformity in the country, it must take into consideration the above mentioned restrictions on its powers. The Federal Government, subject to the above restrictions, has enacted legislation on matters that may be considered to occur in the State List. These laws include the Waters Act, Land Conservation Act, Fisheries Act, Streets Drainage and Buildings Act, Local Government Act and National Land Code.

(4) The State Authorities, by virtue of the fact that water and matters relating thereto, and in particular land is within their jurisdiction, would appear to be in a better position to control and regulate matters on the ground pertaining to the effective management of water resources in their respective States. The State of Selangor in particular has enacted the SWMAE that has resulted in the establishment of the SWMA. The latter Authority is expected to regulate and manage all water resources in the State on a sustainable basis.

(b) <u>Land</u>

(5) Pursuant to List II of the Ninth Schedule, item 2, all matters relating to Land is under the State. Consistent with Article 76(4) Parliament enacted the National Land Code for the purpose of uniformity in the administration of land throughout the Federation. The definition of "land" includes land under water. Together with land, related matters such as forestry, agriculture and mining, are also under State jurisdiction. Article 91 also establishes the National Land Council (which comprised of Federal and State representatives chaired by the Minister) which formulates national policies "for the promotion and control of the utilisation of land… for mining, agriculture, forestry or any other purpose…". The Federal Government or any State Government may consult the NLC with respect to any matters relating to the utilisation of land or in respect of any purported legislation dealing with land or the administration of any such law. The Federal and State Governments shall implement the policy so formulated. Article 92 allows the Federal Government to proclaim any area as a "development area". Upon such declaration Parliament may give effect to the "development plan" by making **any laws** necessary to implement the Plan including on matters which are not under the Federal List. *Putrajaya was declared under Article 92.*

(6) The Constitution contains no direct reference to the management or control of catchment areas. Compared to the Federal List however the State List includes matters pertaining to land including colonisation, land improvement and soil conservation, agriculture, forestry and water, including rivers, canals, riparian rights, turtles and riverine fishing. The Concurrent List includes the protection of wild animals, birds, national parks, drainage and irrigation and rehabilitation of land that has suffered soil erosion. It would appear that the State has more powers over catchment management than the Federal Government.

(c) <u>Municipal Administration</u>

(7) Pursuant to List II of the Ninth Schedule, item 4 local government including local government services, local administration, obnoxious trades and public nuisances in local authority areas are under the jurisdiction of the State Governments. Article 95A also establishes the National

Council for Local Government (which comprised of Federal and State representatives chaired by the Minister) which formulates national policies "for the promotion, development and control of local government throughout the Federation and for the administration of any laws relating thereto…" The Federal and State Governments shall implement the policy so formulated. It is also the duty of the Federal and State Governments to consult the Council in respect of any proposed legislation dealing with local government.

(d) <u>Environmental Management</u>

(8) There is no direct reference to the control and regulation of environmental pollution in the Constitution as concern for the environment and control of pollution are relatively new issues. It is necessary therefore to infer the source of authority for environmental matters by examining particular issues. In the Federal List Item 8 "Trade, commerce and industry" - sub-item (k) which relates to "factories, boilers, machinery, and dangerous trades" and sub-item (l) relating to "dangerous and inflammable substances" are the only specific items which may be inferred to impinge on environmental issues.

(9) There are however more items under the State List, such as

- item 2 which relates to "land, land improvement and soil conservation"
- item 4 which relates to "local government, including obnoxious trades and public nuisances in local authority areas and local administration"
- item 6 which relates to "water, control of silt and riparian rights"
- item 12 which relates to "turtles and riverine fishing"

(10) They may all be inferred to relate to environmental concerns. The Concurrent List also includes similar provisions, such as

- item 3 for "the protection of wild animals and birds including national parks"
- item 5 for "town and country planning"
- item 7 includes "public health, sanitation and the prevention of diseases"

- item 8, which relates to drainage and irrigation
- item 9 includes "the rehabilitation of mining land and land which has suffered soil erosion"

(11) All of the above may, in their particular areas, is inferred to include environmental concerns.

(12) It would therefore appear that both the Federal and State Governments have powers over environmental matters depending upon the subject matter under consideration. In the leading case of *Ketua Pengarah Jabatan Alam Sekitar & Anor. V Kajing Tubek & Ors.* (3 MLJ 1997) the Court of Appeal decided that (in the event of conflict between State law and the Federal EQA) environmental law which was to be applied depends on the specific subject matter to which it applies and whether the State or Federal Government had powers on the matter. Environmental matters related to land, water and municipal services for example would be under the State Government. *Article 77* also provides for residual powers whereby the State Legislature may make laws with respect to any matter *not enumerated* in any of the Lists set out in the 9th Schedule, if it is not a matter in respect of which Parliament has powers to make such laws. This Article would be relevant in considering matters that are not clearly delineated in the Constitution, such as for example, matters pertaining to the environment.

(13) *In so far as the constitutional position related to catchment management is concerned therefore it would appear that State Governments have the jurisdiction to play a larger role than the Federal Government.*

8.1.5 Review Of Existing Legislation

8.1.5.1 Introduction

(1) Consistent with the constitutional position whereby both the Federal and State governments appear to have jurisdiction over water it is not surprising that the management of water resources in Malaysia is covered by numerous Federal and State laws. Legislation in Malaysia directly or indirectly related to water, land, municipal government and the environment is itemised in Appendix 8.1.1

8.1.5.2 Ownership of Water and Water Rights

(1) Various legislation relating to water vest ownership of water in the State Governments, particularly in terms of waters that occur in rivers and water bodies within the State. Pursuant to this the Waters Act 1920 provides that "the entire property in and control of all rivers in any State is and shall be vested solely in the Ruler of such State." It defines a "river" to include:

- "a tributary of a river and any other stream or natural water course; and
- any canal declared by the State Authority of the State . . . by notification in the Gazette."

(2) The Waters Act has been repealed and replaced with the SWMAE in Selangor. The SWMAE is a much more comprehensive legislation and it vests far greater powers of control over all waters including wetlands, ground water, lakes and other water bodies and coastal waters.

(3) State ownership of water is further entrenched by the National Land Code that identifies "water" as an integral element of "land," whose disposition is subject principally to State control. The Mining Enactment, 1929 further considers "water" as a property that vests with the Ruler of the State.

(4) The right to use water, whether it is surface or underground, is thus subject to the control of the State Authority. Unlike many other countries such as the USA there is no private ownership rights to water. In practice, the owner or occupier of land may use water for domestic purposes and in this respect is not required to hold a licence to enjoy such usage. The SWMAE however specifically prohibits, except for subsistence agriculture, the diversion of water from any river or the taking of any water except in accordance with the terms of a licence. Licences to divert water from rivers for private, domestic or industrial purposes or for agriculture may be granted by the SWMA. The SWMA is empowered to authorise the licensee to erect, cut or construct and maintain upon any State lands or alienated lands any drain, dam or reservoir and to take and use the water therefrom in such quantities and in such manner as the SWMA may approve under the licence.

(5) The Agreement between Putrajaya and Selangor does appear to reserve all rights over water to the State and a strict application of this Agreement would mean that Putrajaya should obtain the approval of the State for actions related to waters and the Lake. However the SWMAE appears to exclude its application to Putrajaya but under limited circumstances. The exclusion of application of the Enactment is only under circumstances where any river or water body **occurs wholly** within Putrajaya. It would appear that there are no such rivers as all of them originate outside Putrajaya. It also now appears that the Lake itself, in Phase Two of its inundation program, will eventually stretch out of Putrajaya into Cyberjaya. If this does occur then the Lake too would not be exempted from the application of the SWMAE as it would not fall wholly within Putrajaya. *Under the circumstances it would appear that the SWMA would have authority over the whole catchment area including those areas within Putrajaya.*

8.1.5.3 Recreational Activities on Water Bodies

(1) States do have power to enact laws pertaining to local shipping and navigation on rivers, lakes and other inland water bodies outside the limits of ports and harbours. Pursuant to such powers under the Constitution, various states have enacted legislation (some under the colonial administration) which include:

(a) The Waters Enactment, 1920 (adopted, some with amendments, by most States);
(b) The Selangor Waters Management Enactment, 1999;
(c) River Launches (F.M.S.) Cap.177; Pahang (En No. 6/49);
(d) River traffic (Kelantan) En. 2/1955;
(e) River Traffic (Trengganu) En. 3/1988;
(f) Sarawak Rivers Ord., 1993;
(g) Sarawak Water Ord., 1994; and
(h) Lights and Registration of Small Shipping Enactment, 1899 (Selangor), Federated Malay States Enactment XXVII of 1899.

(2) In general such legislation provides for the control of navigation on inland waters and regulates localised traffic within rivers. It provides for the licensing and registration of small boats in local waters. Under the Local Government Act (LGA) the local authorities have enabling municipal powers to control any recreational activity on rivers and other water bodies including navigation, swimming, boating, fishing and any other works

carried out on such water sources. The requisite power of a local government has been delegated to the Perbadanan by the State.

8.1.5.4 Drainage, Buildings and Earthworks

(1) The carrying out of any earthworks and buildings is controlled under the Street, Drainage and Building Act (SDBA). The SDBA provides sufficient powers to local authorities to effect control on all building and earthworks within their jurisdiction. Earthworks include earthworks undertaken on any land that includes land under water. Perbadanan Putrajaya has made Earthworks By-Laws to control all earthworks. Present day approach to the control of earthworks, particularly in respect of prevention of soil loss and erosion and the consequent siltation of rivers, does not seem to be adequately addressed within present by-laws. *There are adequate powers within the SDBA, LGA and TCPA to address this issue and greater attention should be given to this aspect.*

(2) Drainage in municipal areas is the responsibility of the Local Authorities under the LGA and SDBA. Every Local Authority is empowered to make bylaws to provide drains in the interest of public health. None of the authorities have however made any drainage by-laws. Local authorities appear to follow the Urban Drainage Design, Standards and Procedures issued by the DID. The authority is also empowered to impose a drainage rate or fee to defray the construction and maintenance cost of such drainage systems. The SDBA also imposes an obligation on the Local Authority to construct and maintain drains. The cost for construction and maintenance of such drains may be recovered from persons who are "frontagers" to such works. Usually the developer of a housing scheme is required to pay a deposit to enable the local authority to construct drains. Alternatively, the developer is required to construct the drains to standards determined by the Local Authority. The Local Authority has powers under this Act to levy fees or charges to enable it to defray expenses in executing its functions. It also has powers to determine the location, design, flow and other detailed characteristics of drainage in any area within its jurisdiction. The problem of diversion of the flow of waters away from the Lake can be addressed under these laws.

(3) Whilst the SDBA provides adequate powers for the design and layout of drainage it does not however provide for controls over the quality of discharge of such drains. The quality of discharge

may be controlled under other legislation such as the SWMAE and the EQA. The EQA controls largely point sources of discharge originating from prescribed premises such as factories and plants. The SWMAE can control both point and non point sources of discharge into any water source including the connection of urban drains into rivers. Local authorities too, have some limited powers (under the LGA) in terms of controlling discharge of effluents and noxious substances into any drain.

(4) *There will be a need for local authorities, DOE and the SWMAE to work together on determining the quality of discharges into any water source. There is also a need to address the quality of runoff from streets to ensure that its main pollutants such as oil and grease is trapped and removed before it enters rivers and the Lake. Appropriate technical measures will have to be considered for this purpose and the drainage systems appropriately designed.*

8.1.5.5 Flood Mitigation

(1) Traditionally, drainage and flood control works and services have largely been undertaken by the Department of Irrigation and Drainage by virtue of its role in providing drainage and irrigation for agricultural development as provided for in the Concurrent List. The Irrigation Areas Act, 1953 and the Drainage Works Act, 1954, accordingly provides for the control, protection and maintenance of such works and services and appropriate authority is vested with the DID Engineer for this purpose.

(2) Under the Ministerial Functions Act, 1969, the Minister of Agriculture has responsibility for and is entrusted with the responsibility for flood mitigation and river conservancy works. The actual implementation is carried out by the DID, an agency under the Ministry of Agriculture, and which also acts as the Secretariat to the Flood Commission. The Minister of Agriculture is currently the Chairman of the Commission.

(3) The DID obtains large Federal funding for flood mitigation works. In carrying out large scale flood mitigation and agricultural drainage works country-wide, the DID had invariably undertaken urban drainage works as an integral part of such projects (like in Kuala Lumpur, Georgetown, Batu Pahat, Kota Bharu and other major towns).

(4) Urban Drainage Design Standards and Procedures, currently in use by all local authorities, were developed by the DID. The DID continues to provide specialist services in urban drainage to local authorities, wherever such competencies are deficient.

(5) Municipal authorities consider large urban drainage works, particularly those involving flood mitigation and riverine works, as the responsibility of DID, especially since such works invariably involve more than one LA area.

(6) However, from a strictly legal sense, drainage within local authority areas is the sole responsibility of the local authority. The State Governments are responsible for drainage and flood mitigation within the State concerned.

(7) With the implementation of the SWMAE, the SWMA should work with DID as the latter has a macro view of the problem.

8.1.5.6 Catchment Management

(1) In order to minimise, prevent or mitigate potential problems of flooding, ensure adequate flow of waters and maintain water quality, catchment areas must be carefully managed, preserved and protected. The immediate land reserves surrounding rivers and other water sources such as the Lake should be similarly managed. There are various laws pertaining to these matters. The Land Conservation Act 1960 enables the State Authority to declare any area to be "hill land" by notification in the Gazette. Upon such declaration no person can clear such land or interfere with or destroy trees and plants on such land. This is to prevent soil erosion and siltation.

(2) Under the Forest Enactment, State Authorities may also constitute any area as a reserved forest for the purposes of protecting catchment areas. Upon such proclamation all activities within the area are prohibited. Generally, the administration of land is undertaken through the National Land Code and this law can also be used to control development. Detailed urban planning is sanctioned by the State Authorities under the Town and Country Planning Act. Within local authority areas the structure and local plans can play a critical role in controlling and determining appropriate development and compatible land use patterns within the catchment area.

(3) The SWMAE provides for catchment management of river basins within Selangor. Among others it has powers to:

(a) take measures to protect the water from pollution;
(b) take measures to improve the quality of water;
(c) prevent any unauthorised interference with the flow or availability of water;
(d) declare flood zones, river reserves, protection zones and buffer zones;
(e) declare catchment areas; and
(f) control all works within such catchment areas.

(4) The SWMAE makes possible the adoption of a more comprehensive approach and can be a powerful vehicle for the management of the Lake catchment area.

8.1.5.7 Environmental Protection

(1) The Environmental Quality Act of 1974 (EQA), a Federal law, is the principal legislation pertaining to environmental protection. Section 25 of the EQA provides that "no person shall, unless licensed, emit, discharge or deposit any waste into any inland waters in contravention of acceptable conditions." The Minister of Science, Technology and Environment may specify the acceptable conditions for emission or discharge of waste into any area of the environment. Pursuant to this Act, several regulations have been enacted.

(2) The Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977 regulate discharges from palm oil refineries. The Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978 regulate discharges from rubber operations. The Environmental Quality (Sewerage and Industrial Effluents) Regulations 1979 regulates discharges from the industrial sector.

(3) The EQA has also prescribed catchment areas for water intake points and the classification of such areas for purposes of maintaining water quality. The application of any rules pertaining to water or rivers will however require the prior approval of the State concerned.

(4) The EQA applies to all States in the country. However Sarawak has enacted some of the provisions of the EQA into state

legislation. The Department of Environment (DOE) licences prescribed premises so as to monitor discharges from such premises. It is also supposed to monitor water quality from these sources of discharge so as to ensure that discharges are maintained within the stipulated limits. Section 34(A) of the EQA provides for environmental impact assessment. The Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987 has prescribed measures to prevent or mitigate the impact of large projects. The EIA requirement is a preventive measure to ensure that proposed projects take into consideration environmental matters in their implementation. The EQA and in particular the EIA regulations do not cover existing projects or the smaller projects. Further there appears to be problems of enforcement of the EIA conditions and the monitoring of implementation of such conditions. The EQA also does not cover non-point sources of pollution.

(5) Besides the EQA, the SWMAE provides for control of pollution in water sources. The Enactment prohibits the discharge of any poisonous, noxious or polluting matter that will render any water source harmful to public health, safety or welfare, or to animal or plant life or other beneficial uses of such water source. However, discharges may be made by licence approved by the SWMA in line with the SWMA's overall strategy of protection and sustainable management of a water source. Except for the Fisheries Act and the SWMAE, none of the other laws cover the requirement for minimum flow to protect in stream resources.

(6) Part VIII of the LGA also provides for the control of activities or nuisance that may pollute "any stream, channel, public drain or other water course within the local authority area". Local authorities may:

(a) prevent littering or depositing of any wastes or filth;
(b) prevent any waste being allowed to flow or the discharge of any liquid or solid;
(c) regulate bathing, washing or swimming of persons or animals;
(d) prohibit, abate, remove or prevent the occurrence of any nuisance;
(e) control the method of cultivation, irrigation and the use of manure or fertilisers;
(f) control the keeping of fish; and

(g) generally, to do all things necessary for or conducive to safety of the public, health and convenience.

(7) All three local authorities within the Lake catchment area have enacted various rules including anti-litter, control of activities in parks and vandalism (See Appendix 8.1.1 for the full list). None of them have however tackled issues related to pollution in general or non-point sources of pollution as in (e) above which would be an important source of non-point pollution. The authorities, with the exception of Perbadanan, have not made any systematic approaches to manage water sources within their jurisdiction.

(8) Strict control of pollution is a matter vital to the maintenance of the water quality in the Lake. Whilst the EQA is a specific law made to control environmental concerns its approach however has been "national" rather than "local". Its application in localised areas for specific concerns may lead to inadequacies. It is also dependent on the capacity and capability of the DOE on the ground. The DOE certainly does not have the capacity to undertake strict enforcement of the EQA in particular catchment areas. Standards determined by the DOE are meant to apply throughout the country. It may not be adequate for the purposes of the Lake. *The SWMAE provides an alternative in this respect for the integrated management of the catchment area.*

8.1.5.8 Mining

The Mining Enactment, 1929 allows the taking, diversion and discharge of water for the purposes of mining. The National Land Code allows the Land Administrator to allow the mining of rock material (including sand) from rivers. The impact of such mining activities on river regimes would be severe and cause a disruption to the flow of the water including having an adverse impact on the in-stream resources of the water sources. However the SWMAE has now imposed a requirement for consultation and approval prior to any of these activities being undertaken by the authorities.

8.1.5.9 Stakeholder Participation

Participation by the affected parties including consumers, water users, land owners and non government organisations has generally resulted in better compliance with the laws and more effective and less costly implementation in many countries. *Only the SWMAE provides for the participation and encouragement of formation of stakeholder groups.*

8.1.6 Recommendations

8.1.6.1 Based on the above review the following are the main points of some pertinent recommendations. They are discussed in details below.

- Sub-catchment management approach
- SWMAE – the legal vehicle for integrated sub-catchment management
- New rules under the SWMAE

8.1.6.2 ***(a) Sub-catchment management approach***

It would appear that there is a number of enabling legislation that would allow the catchment to be managed by the various authorities. However the profusion of laws may not allow and in fact could be a hindrance to the integrated management of the Lake catchment area. Most of the rivers in the catchment area are also part and parcel of the larger Sg. Langat Catchment. The full application of the SWMAE including the designation of the Sg. Langat Catchment as an integrated river basin management area may take some time. *In the interim it is recommended that a sub-catchment management approach be adopted for the Lake's catchment area.*

8.1.6.3 ***(b) SWMAE – the legal vehicle for integrated sub-catchment management***

The SWMAE presents the best legal vehicle to implement an integrated sub-catchment management plan for the Lake Catchment. *The Enactment is comprehensive and well suited to manage the whole sub-catchment area including the area within Putrajaya.* A detailed review of the SWMAE is included in Appendix 8.1.2. The SWMA has the legal authority to manage the Lake Catchment area. However it would be far better for the SWMA to take the lead but work together with the Perbadanan in managing the catchment area both inside and outside Putrajaya.

A sub-catchment management plan could be drawn up under the SWMAE and jointly implemented by SWMA, Putrajaya, Sepang and Subang local councils. The SWMAE together with the various provisions of the SDBA, LGA and TCPA could then be used to implement the plan. An appropriate institutional framework for such co-operation amongst all stakeholders should be formulated.

8.1.6.4 ***(c) New Rules under the SWMAE***

Having reviewed the recommendations made by the various specialists in the Study Team for the management of the Lake Catchment area the Consultant are of the opinion that it is not necessary to review or make amendments to any existing legislation. At this point in time the Consultant does not see the need for any rules other than that pertaining to the designation of the sub-catchment area. Thy can be done later after the Sub-Catchment Management Committee has been formed and started its work. This is because the Committee would be in a much better position to assess the need for supporting rules and the declaration of the sub-catchment as a designated area under the SWMAE. There are presently sufficient powers within the SWMAE for the Committee to start off with its work.

8.2 INSTITUTIONAL STUDY

8.2.1 Introduction

8.2.1.1 The objective of the institutional component of the study as outlined in item 5 (xiii) of the "Scope of Work" of the Study Terms of Reference, relates to:

"Examining the existing institutional arrangement/set-up and legislation, and recommend improvement for the effective implementation of the proposed catchment and monitoring plan".

8.2.1.2 The study scope covered the following:

(a) Existing Institutional Framework Study

A systematic review of the existing institutional arrangement/set-up and administrative framework of important institutions which in one way or another have responsibilities for water, land and catchment management. It involved an analysis of the role and responsibilities, organisational structure and function of these authorities in relation to the above concerns areas of management.

(b) Recommended Institutional Framework Study

A study to develop and recommend the most effective and appropriate institutional/administrative arrangement or set-up to implement and manage the developed Catchment Development and Management Plan for Putrajaya Lake. It involved examining the legislative provisions for such a set-up and the action programme recommended by the various consultants involved in the project.

(c) Stakeholder's Participation in Catchment Management

A study to determine the strategies for engaging current and future catchment stakeholder’s participation for sustainable management of the catchment.

8.2.2 Existing Institutional and Administrative Framework

8.2.2.1 Introduction

(1) Land and water and the use of such resources represent the most important elements in the management of the Putrajaya Lake catchment. Jurisdiction over the subjects of "land" and "water" is spelt out within the provisions of the Constitution. (Please see Section 8.1.5.2 for a review of this matter). These provisions provide the basis for the formulation of laws for administration of matters related to the two subjects. Associated with the formulation of laws is the requirement that necessary institutions be set up to administer them.

(2) As outlined in the Constitution, "water" and "land" are State matters, which means that jurisdiction for control and use of these two resources rest with the states concerned. In relation to water, ownership of water that occurs in rivers and other water bodies is vested in the State within which the resource is located. Based on these provisions it can be seen that administration of water and land with regards to the right to use rests with the states concerned, except in so far as the state may assign such responsibilities to authorities that the state designates otherwise. Hence any proposal to use these resources or change its use category generally requires the approval of the States.

(3) The catchment of the Putrajaya Lake falls within the two Districts of Sepang and Petaling in the State of Selangor. The two districts are administered by the respective District and Land Offices who have as their head a District Officer.

(4) Within these two districts, three local government administrative areas are to be found within which the Putrajaya Lake catchment lies. The three local authorities administering these areas are:

- Perbadanan Putrajaya,
- Majlis Perbandaran Subang Jaya, and
- Majlis Daerah Sepang

(5) In general, local governments are sub-sets of the State Government who generally have powers to control such matters as the use of land and water within the areas of local

authorities. In the case of Perbadanan Putrajaya, it is a body established by an Act of Parliament to administer and manage the Kawasan Perbadanan Putrajaya on behalf of the Federal Government. The State of Selangor has assigned most of its powers and functions relating to local government to the Perbadanan and the Minister responsible, under the main legislations to which local authorities have jurisdiction, these being the *Street, Drainage and Building Act, 1974* (SDBA), the *Local Government Act, 1976* (LGA) and the *Town and Country Planning Act, 1976* (TCPA). It thus differs from the other two local authorities in that it has powers to act independently of the State in so far as matters related to land use and land use planning are concerned. However, in matters related to land revenue and "water and water supply and the revenue collected therefrom" these remain with the State (see Ramadas, 1999).

(6) The following review briefly describes and discusses the functions and responsibilities of various levels of government and the authorities and departments relevant to the development and management of the catchment of the Putrajaya Lake.

8.2.2.2 State Government of Selangor

(i) ***Administration***

(1) The highest level of government administration, in respect of matters relating to land and water affecting the Putrajaya Lake catchment, is the State Government of Selangor. Changes in land use or the use of water for any purpose requires, in general, the approval of the state. The highest level of authority for decision making is within the purview of the Majlis Mesyuarat Kerajaan Negeri (MMKN) or the State Executive Council, chaired by the Menteri Besar. The MMKN is made up of State Assembly Members who are the chairpersons of various portfolios (equated to that of ministers in a Cabinet).

(2) Various state departments and agencies at state and district level assist in planning and development in the state. Local authorities represent the "lowest" level of government in the implementation of projects and programmes for development. The role and function of these authorities are described later in this report.

(ii) ***Planning And Development***

(3) In relation to planning and development within the state, two important committees have been set up which have powers to plan and approve projects and programmes within the state. These are:

- Majlis Pembangunan Negeri (MPN) or State Development Council , and the
- Jawatankuasa Perancangan Negeri (JPN) or State Planning Committee.

(4) The functions of the MPN include the following:

a) Determine the strategy and programme for implementation of development projects in accordance with the National Development Policy,

b) Monitor and evaluate the implementation strategies for programmes and projects, and

c) Assess the progress of implementation of programmes and projects.

(5) In relation to land use and land use planning, the State Planning Committee (JPN) has the function to advise the State Government on matters relating to protection, use and development of land. The members of the Committee include the following:

Chairman : Menteri Besar
Deputy Chairman : Member of MMKN
State Secretary
State Director (UPEN)
State Director (JKR)
State Director (Lands & Mines)
State Legal Advisor
4 Members who are appointed
Secretary : State Director (JPBD)

(6) The JPN plays an important role in catchment management since matters related to project planning

approval and structure and local plans are referred to the committee for review and endorsement prior to approval by the State.

8.2.2.3 State Agencies And Departments

(1) Various state agencies and departments assist in the planning and implementation of various policies, programmes and projects that are planned and proposed to be undertaken in the state. Of interest to the management of the Putrajaya Lake catchment area, are the following:

- Department of Town and Country Planning (JPBD),
- Department of Drainage and Irrigation (JPS),
- Department of Public Works (JKR), and
- Office of Lands and Mines (PTG).

(i) ***Department of Town and Country Planning (JPBD)***

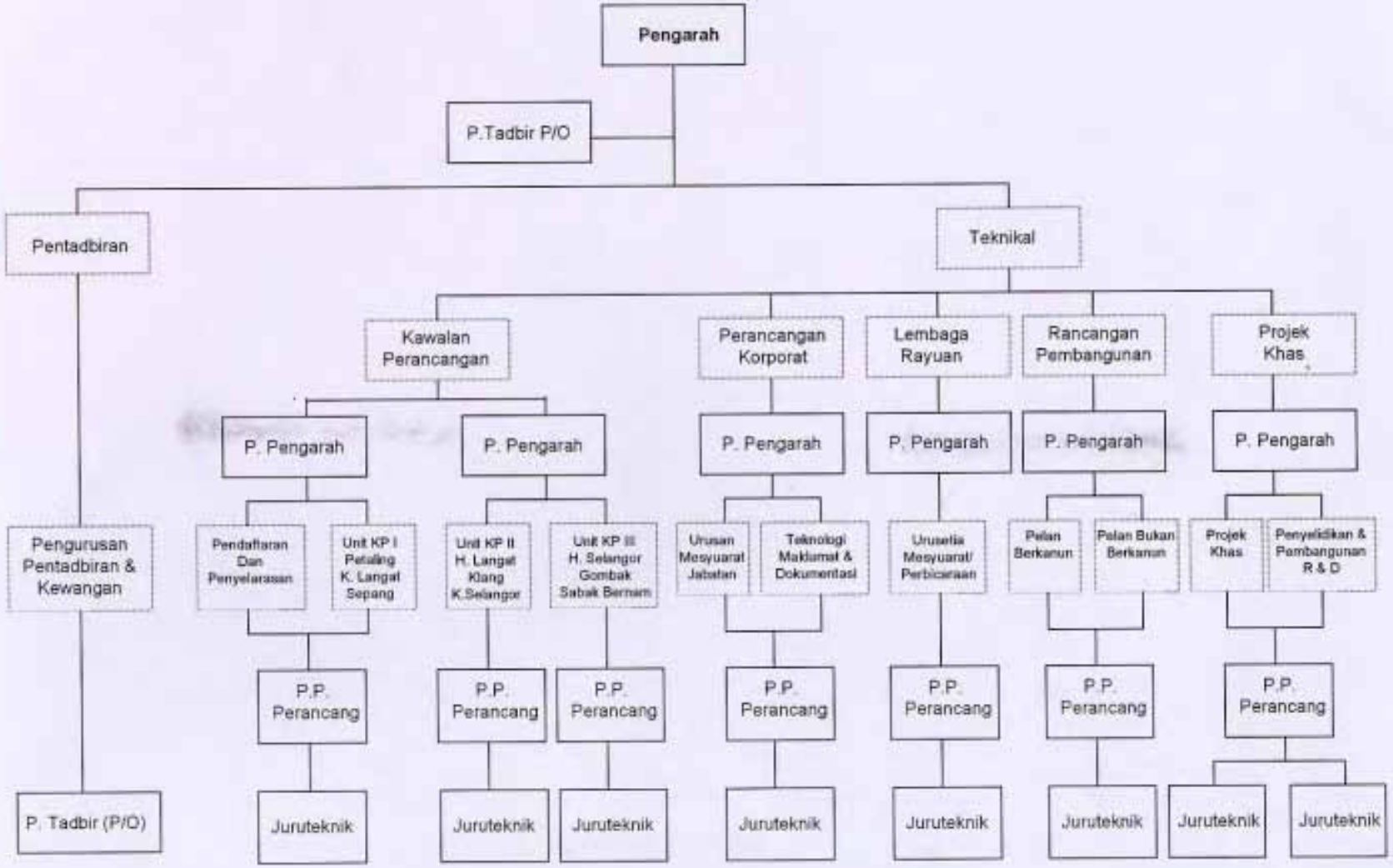
(2) The department has been given powers to advise the State with regards to physical planning and to manage and implement the provisions of the *Town and Country Planning Act, 1976*. The general structure of the department is shown in Figure 8.2.1.

(3) The functions of the department include:

- Advise the State Government and provide feedback to the Federal Government with regards to town and country planning,
- Advise the State Government with regards to policies and controls over the planning of land and buildings,
- Act as Secretariat to the State Planning Committee,
- Collect, collate and analyse data and information for planning, and
- Advise local authorities with regards to policy and control of planning.

(4) JPBD plays an important role in catchment management since it has responsibilities to draft structure and local plans and advise on land use planning and development controls. The type of land use dictates to a large extent the type of activity that would be allowed for a particular

FIGURE 8.2.1 : STRUKTUR ORGANISASI JABATAN PERANCANGAN BANDAR DAN DESA



land area. This has important implications to pollution control and waste management.

(ii) ***Department of Drainage and Irrigation (JPS)***

(5) The JPS operates both as a federal and a state agency since matters to which it has jurisdiction is a shared responsibility under the provisions of the Constitution. The department at state level has responsibilities for the implementation of projects related to irrigation, drainage, river improvement and coastal protection. The organisational structure and general functions of the department at state level are outlined in Figure 8.2.2.

(6) In general the department has been entrusted with the responsibility for implementation of irrigation, flood mitigation and river conservancy works. It is an important organisation with regards to rivers and catchment management. The department has also been largely responsible for providing advise to the State and Federal Governments with respect to water resource planning, use and exploitation.

(7) It is to be noted that drainage within a local authority area is the sole responsibility of the local authority although in some cases, especially with respect to main drainage systems and rivers, the JPS has taken over responsibility or been consulted for advise. It has also been known that the department provides advise to the State with regards to water use, abstraction and diversion. In this regards, the department plays an important role in water resource management since its recommendations have implications to river hydrology and water availability (see section 8.1.6.5).

FIGURE 8.2.2 : CARTA ORGANISASI JABATAN PENGAIRAN DAN SALIRAN NEGERI SELANGOR DARUL EHSAN

(iii) ***Department of Public Works (JKR)***

(8) The role of JKR in catchment management is small since its responsibilities are related to implementation of works, such as bridges, buildings and roads that have indirect impacts to rivers. The responsibility of water supply, which has traditionally been a function of the JKR, has now been taken over by water authorities or water supply departments. More recently, responsibilities with respect to water treatment and supply have been taken over by private companies under the privatisation scheme. However, this is not of concern to the present study since the use of water for public water supply from the Putrajaya Lake catchment does not arise.

(9) Nevertheless, drainage related to road works is important since runoff from roads and other works such as car parks have potential to carry pollutants such as oils and sediment into rivers. For the Putrajaya Lake catchment, concern has been expressed with regards to main JKR roads that cut across the catchment since these roads are frequently used by tankers that carry petroleum and other chemical products. Spillage of such products onto roads and roadside drains and their subsequent discharge into the river or lake system has serious implications to the lake and its wetlands.

(10) The general structure and areas of responsibilities of the department is shown in Figure 8.2.3.

(iv) ***Office of Land and Mines (PTG)***

(11) Land matters in respect of the *National Land Code, 1965* are the responsibility of the PTG. In general the department has the responsibility to co-ordinate matters related to land conversion and the issuance of land titles, mining leases and the collection of land revenue. The department serves as the co-ordinating body for the transmission of all applications related to land conversion, mining and related land matters to the MMKN for decision.

FIGURE 8.2.3 : CARTA ORGANISASI JKR SELANGOR DARUL EHSAN

(12) With respect to catchment management, the department can play an important role in advising the state where there are proposals for the conversion of land within the catchment.

8.2.2.4 Local Authorities

(1) Local authorities are the lowest level of government within the structure of the government system in the country. The powers of local authorities are vested in the *Local Government Act 1976* (LGA), and the *Street, Drainage and Building Act, 1974* (SDBA). In addition, local authorities have also been vested with powers to implement the *Town and Country Planning Act 1976* (TCPA).

(2) The two local authorities of Sepang and Subang Jaya are subservient to the State Government of Selangor while the Perbadanan is subservient to the Federal Government. In relation to matters concerning local authorities, the powers of the State over local authorities, include:

- Accept or otherwise any legislation relating to local authorities that is formulated by Parliament,
- Control changes to boundary, incorporation of new areas and approve the status of a local authority,
- Appoint Council Members, Mayor or the President of a local authority (the Perbadanan is excluded),
- Approve expenditure of local authority (the Perbadanan is excluded),
- Approve appointments of local authorities (the Perbadanan is excluded), and
- Confirm by-laws made by local authorities.

(3) Local authorities have heavy responsibilities since they look after largely urbanised areas where developmental activities are the most intense and rapid. They have an important role in implementation of decisions on land use determined within Structure and Local plans approved by the State, as well as the

approval of building plans and the development of urban drainage. The control of developmental activities that have potential to impact the physical, biological and human environment as a result of earthworks is also an important function of local authorities.

(i) Perbadanan Putrajaya

(4) Perbadanan Putrajaya ("Perbadanan" in short) was established as a body under the *Perbadanan Putrajaya Act 1995* (Act 536), to administer and manage the Kawasan Perbadanan Putrajaya (KPP) on behalf of the Federal Government. The functions of the Perbadanan are to:

- Perform functions of a local government within the KPP;
- Promote, stimulate, facilitate and undertake economic and social development in the KPP;
- Promote, stimulate, facilitate and undertake commercial development, infrastructure development as well as residential development in the KPP; and
- Control and co-ordinate the performance, in the KPP, of the activities mentioned in (b) and (c).

(5) To undertake the above functions, an organisational structure as shown in Figure 8.2.4 has been implemented. The President is the Chief Executive Officer of the Perbadanan and is assisted by a Director General with a Board overseeing the overall functions of the Perbadanan. The Perbadanan has been organised into 4 departments to perform the functions described above. The main areas of responsibilities of each of these departments is also outlined in Figure 8.2.4.

(6) Environmental matters are managed under the City Planning Department within the Landscape and Environment Division, as shown in Figure 8.2.5. The division presently composes of 4 units, namely the

FIGURE 8.2.4 : ORGANISATIONAL STRUCTURE AND ACTIVITIES OF THE PERBADANAN

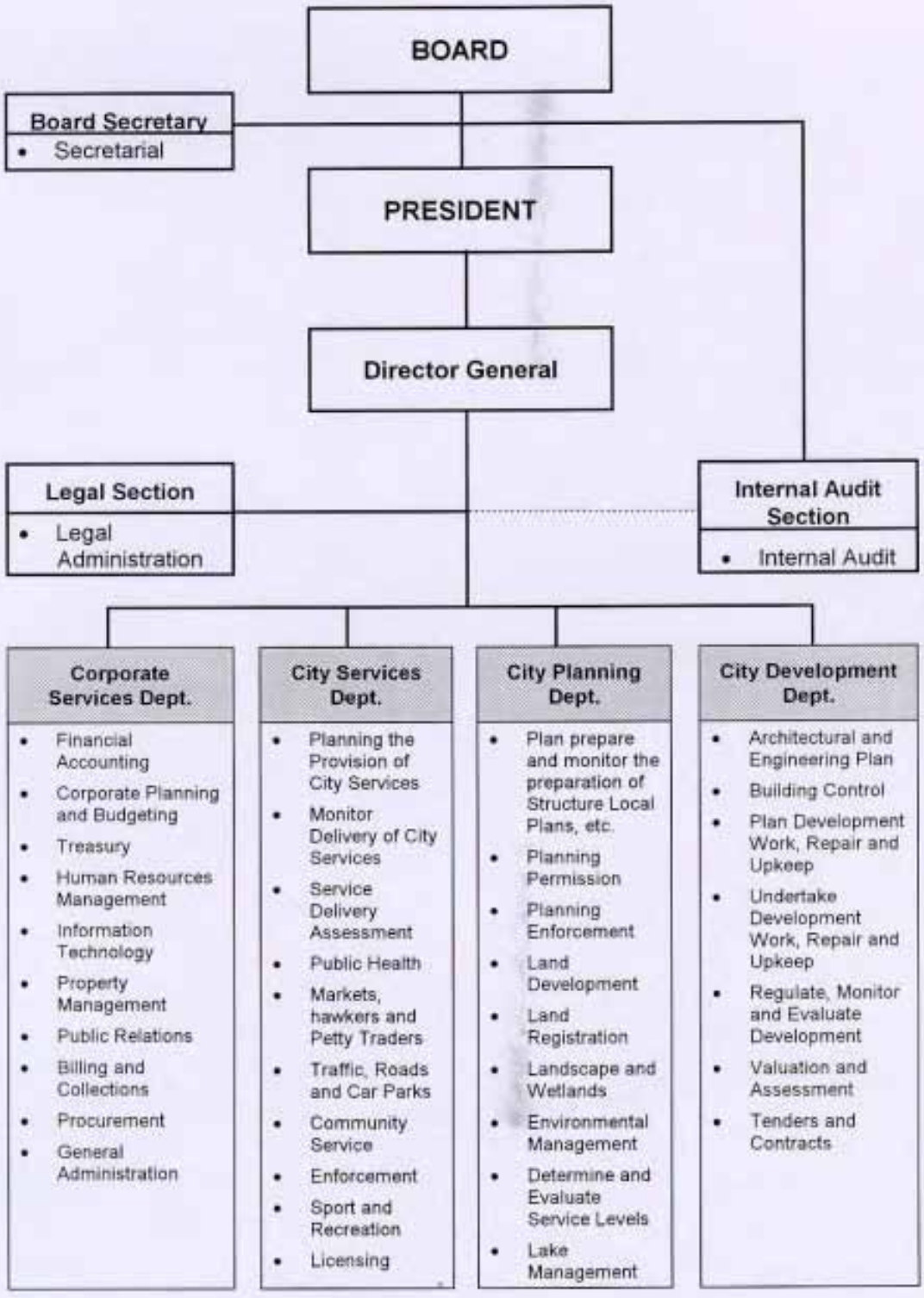
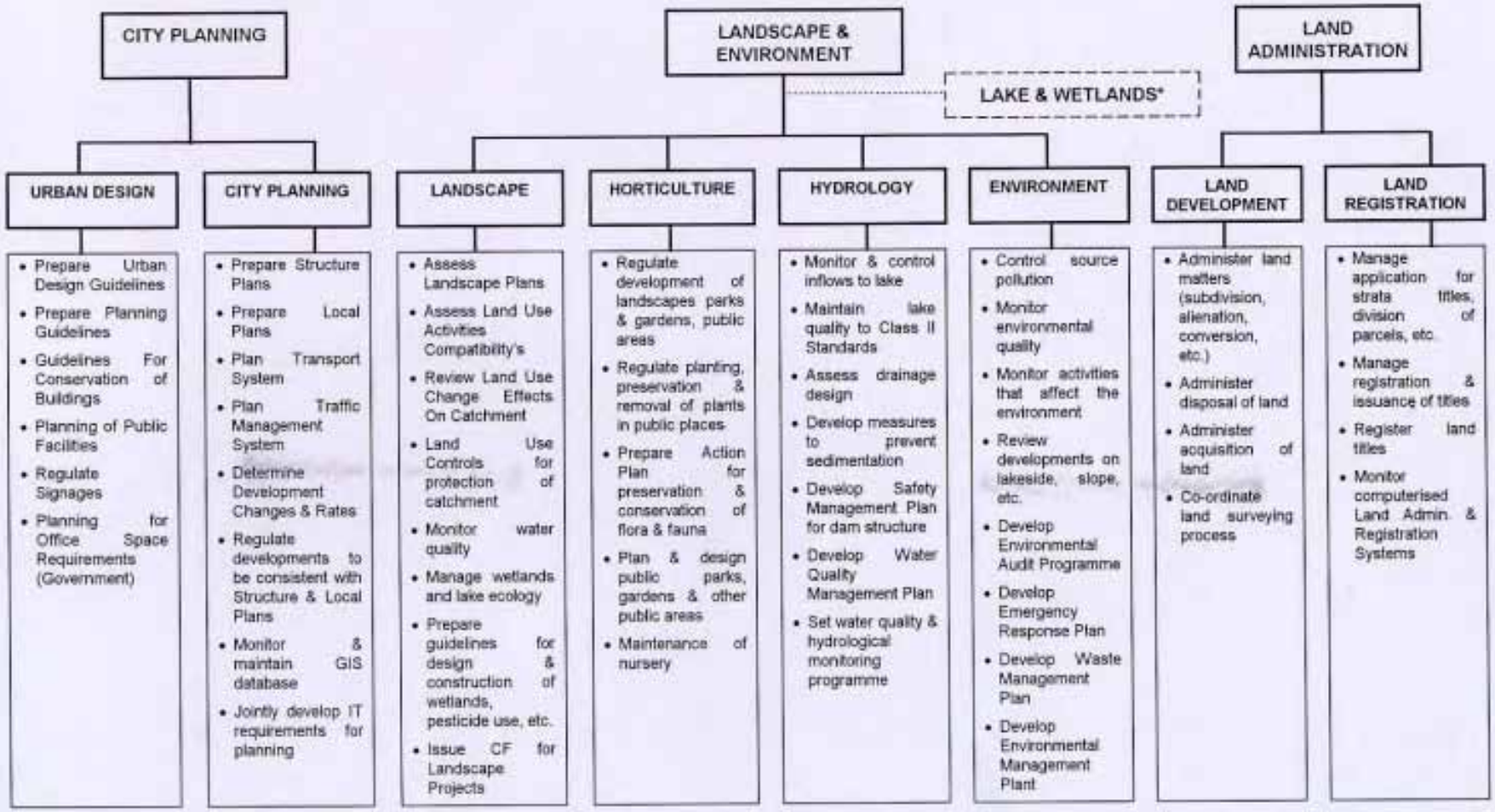


FIGURE 8.2.5 : OUTLINE OF RESPONSIBILITIES OF UNITS IN CITY PLANNING DEPARTMENT



**Proposed new unit for management of the lake and wetlands, (see Figure 8.2.14)*

Landscape Unit, Environment Unit, Horticultural Unit and the Hydrology Unit. Two other units were recommended to be formed, namely the Lake Management Unit and the Wetlands Management Unit (see *Putrajaya Environmental Management Guide, 1998*). Only one new unit, which combines the two functions of lake and wetlands management, has been formed, this being the Lake and Wetlands Unit. The general function and responsibilities of the new unit are described later in Section 8.2.6.2.

(7) Two other Departments which have relevance to lake catchment management include that of the City Development Department and the City Services Department. Within the former department, the Building Control Division is important since the regulation of earthworks and building development falls within its responsibility (see Figure 8.2.6). Besides, monitoring of physical development, project progress and project compliance is the responsibility of the Development Co-ordination Division within the same department.

(8) The responsibility for enforcement with respect to public health, traffic and business establishments is that of the Enforcement Unit of the City Services Department (see Figure 8.2.7). This is besides the enforcement of specific requirements that is undertaken by various units in the other departments.

(ii) ***Local Authorities of Sepang and Subang Jaya***

(9) The status of the two local authorities of Sepang and Subang Jaya differ in that the former operates as a Local Council (Majlis Daerah Sepang or MDS) while the latter as a Municipality (Majlis Perbandaran Subang Jaya or MPSJ). Despite this difference, they share the same functions and responsibilities in the management of their respective areas of control.

(10) The structures of the two local authorities are in general similar, though in the case of MPSJ, it is organised into departments while in the MDS it is organised in the form of divisions (see Figures 8.2.8 and 8.2.9 respectively).

FIGURE 8.2.6 : CITY DEVELOPMENT DEPARTMENT

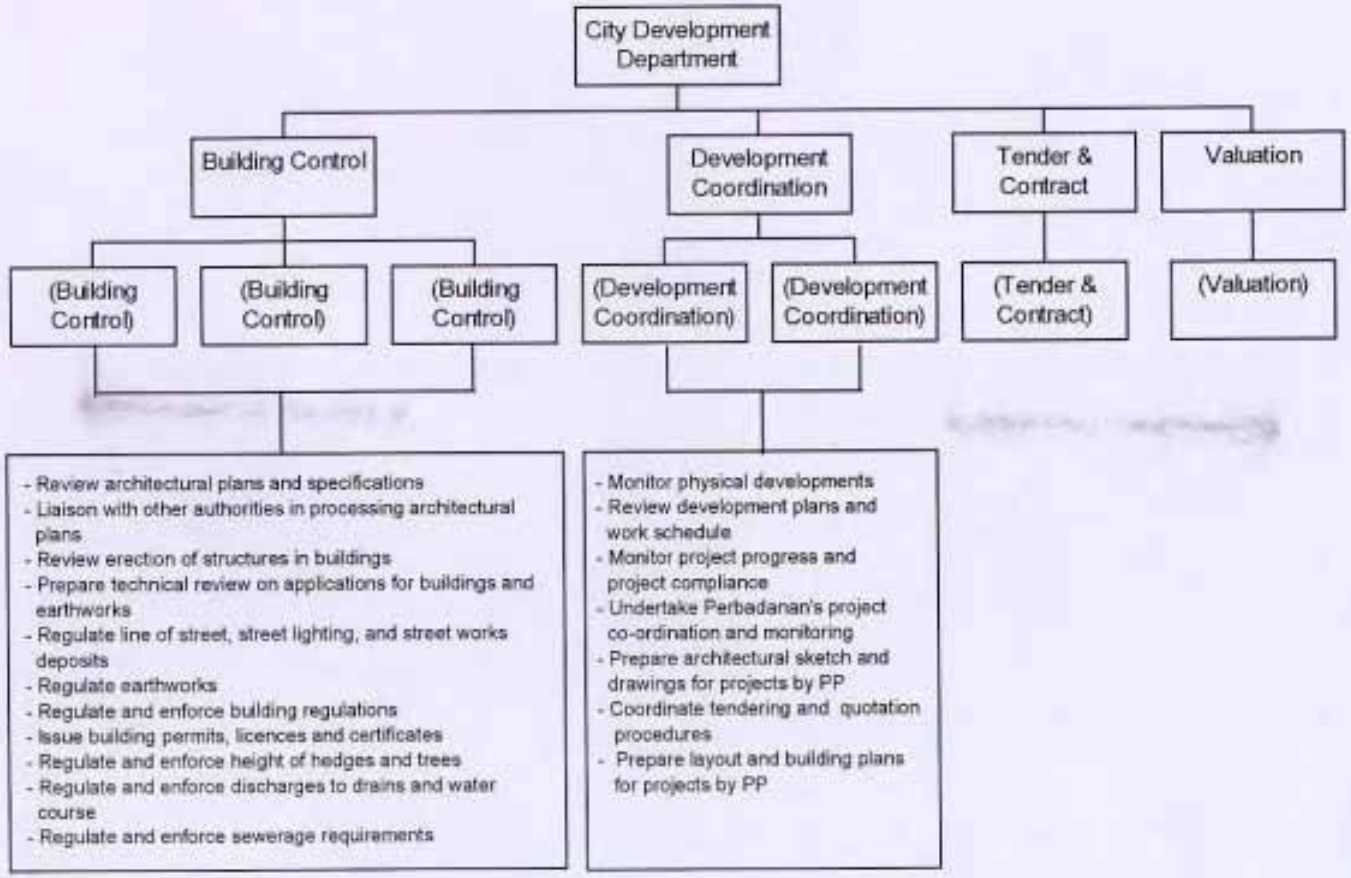


FIGURE 8.2.7 : CITY SERVICES DEPARTMENT

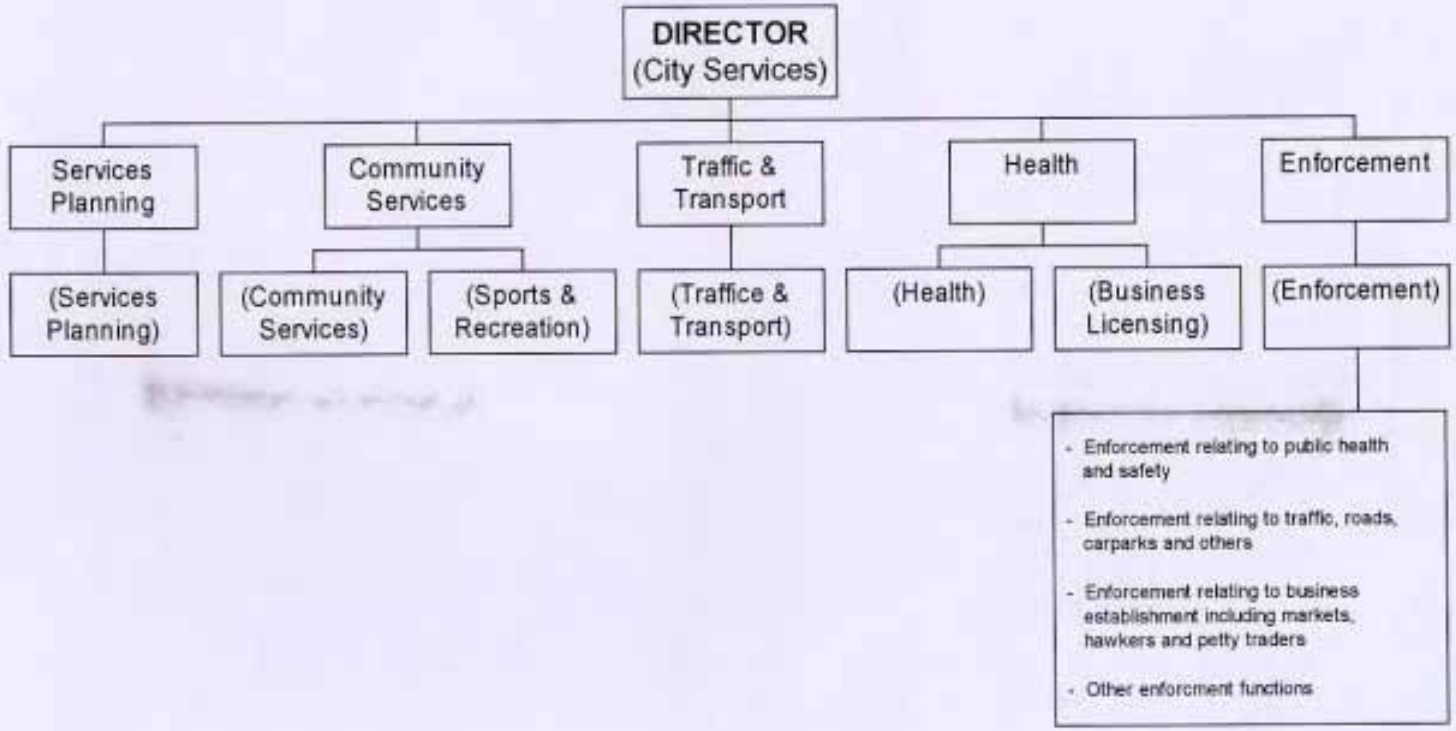


FIGURE 8.2.8 : CARTA ORGANISASI MPSJ

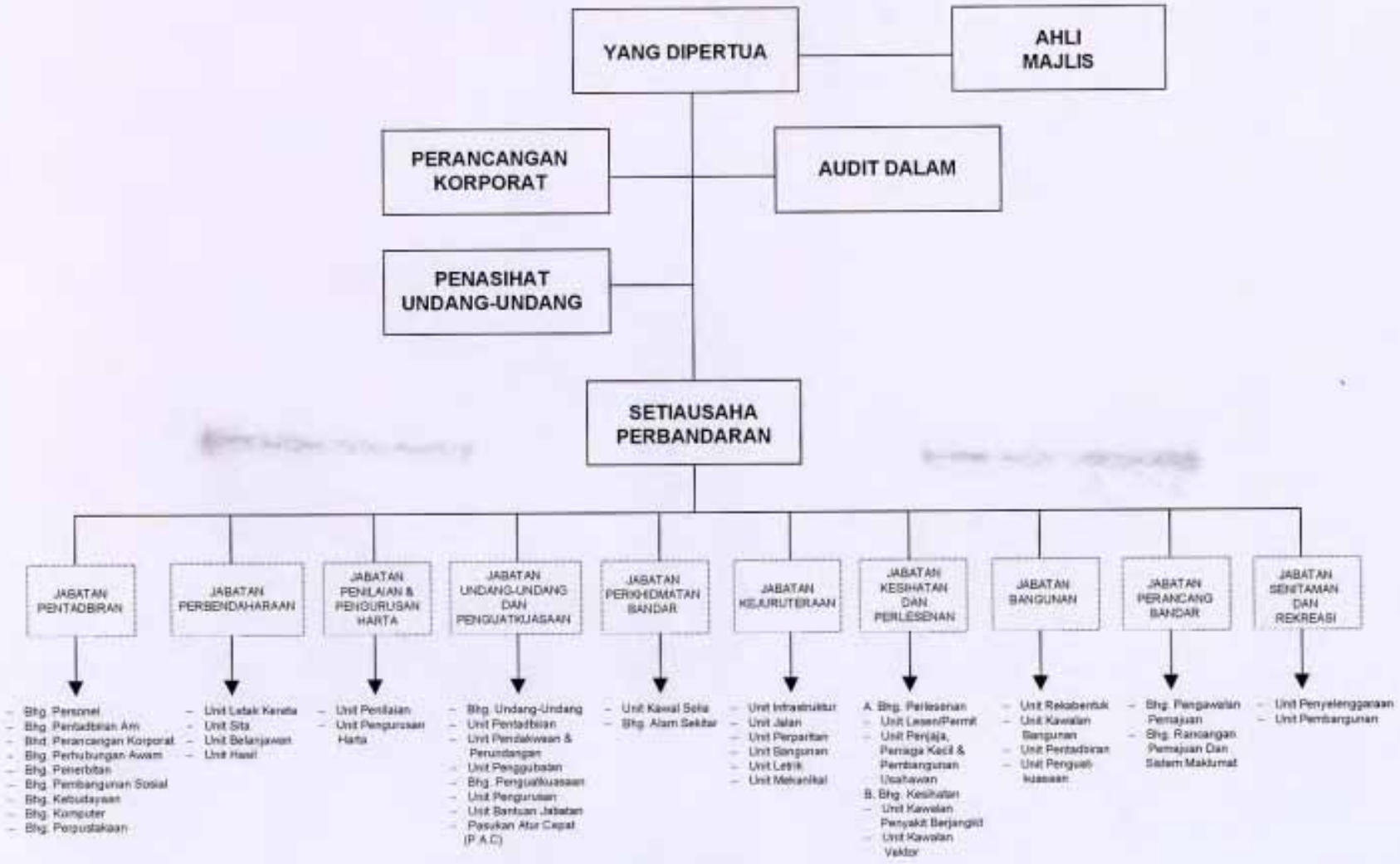
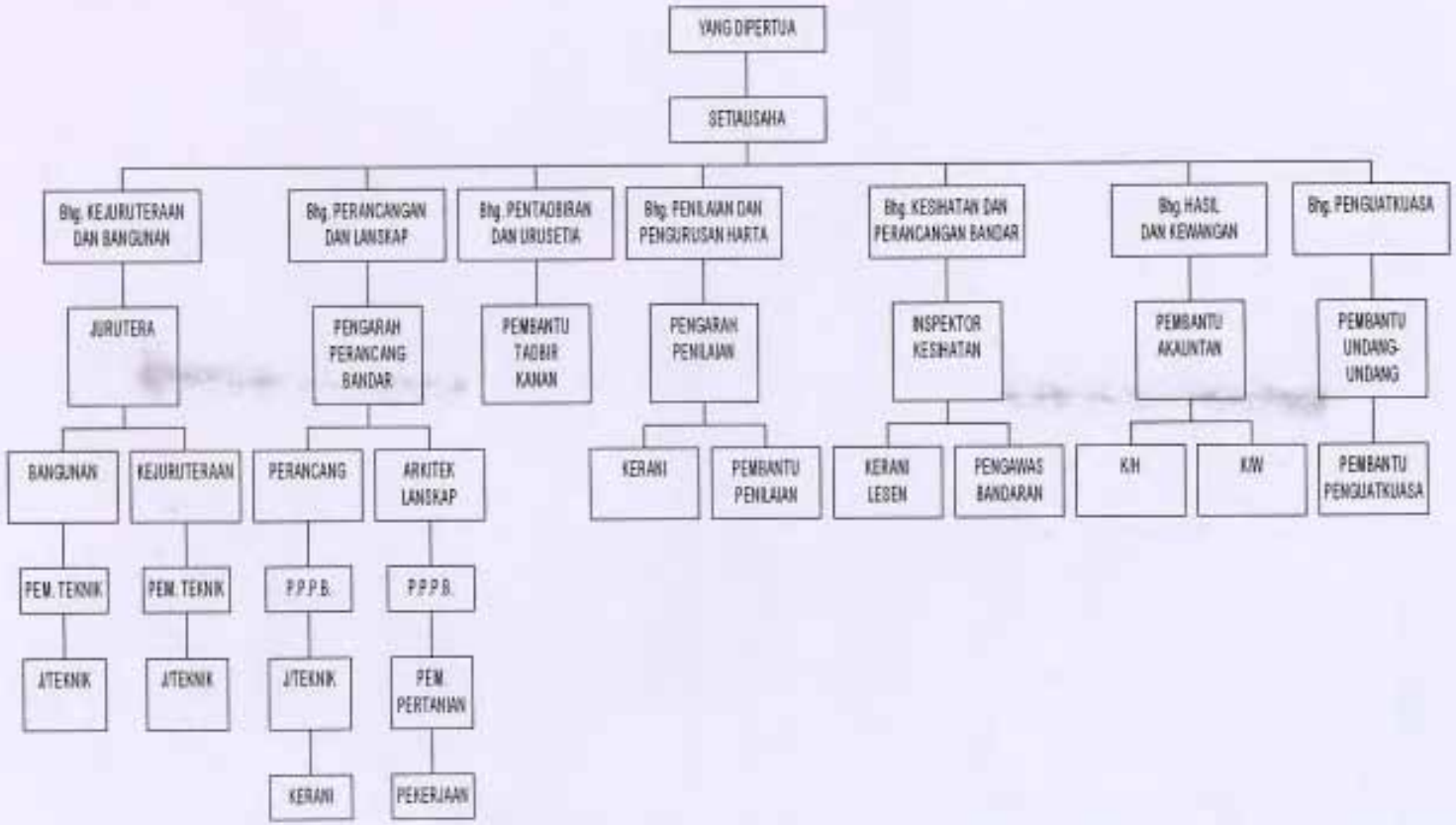


FIGURE 8.2.9 : CARTA ORGANISASI MAJLIS DAERAH SEPANG



Both are headed by a President nominated by the State Government and assisted by a Secretary. However, in the case of the MDS, the District Officer doubles up as the President of the Council. This means that the President is not full time on the job and the Secretary represents the highest level officer who is full time with the Council.

(11) Both local authorities have similar set ups with basic units looking after planning and building, engineering, public health, valuation and management of property, enforcement, revenue and finance and general administration. Presently, MPSJ is better organised in terms of structure and manpower for management and enforcement of various by-laws that have been made under the LGA, the SDBA and the TCPA. The present management and enforcement capability of the MDS is weak, though there are proposals to increase staff strength significantly in the future.

(12) The area of jurisdiction of the MDS is large and covers the new development areas of the Kuala Lumpur International Airport (KLIA) as well as the new townships of Cyberjaya and Salak Tinggi. Unlike the MDS, MPSJ has jurisdiction over largely urbanised and developed areas with a larger population compared to that of the MDS.

(13) In relation to the Putrajaya Lake Catchment, the area of catchment that lies outside the boundary of the Perbadanan falls within the jurisdiction of the two local authorities, with a larger area falling within the MDS and the remainder under MPSJ. In terms of potential to impact the lake catchment, the former area is more important since these are areas that are privately owned and have high potential to be converted for other land uses. Areas that are presently classified as “institutional”, such as those that belong to MARDI and UPM, are less likely to be converted to other land uses since the types of development that are likely to be allowed would not be expected to deviate from that of the institutions concerned, which are for research and teaching.

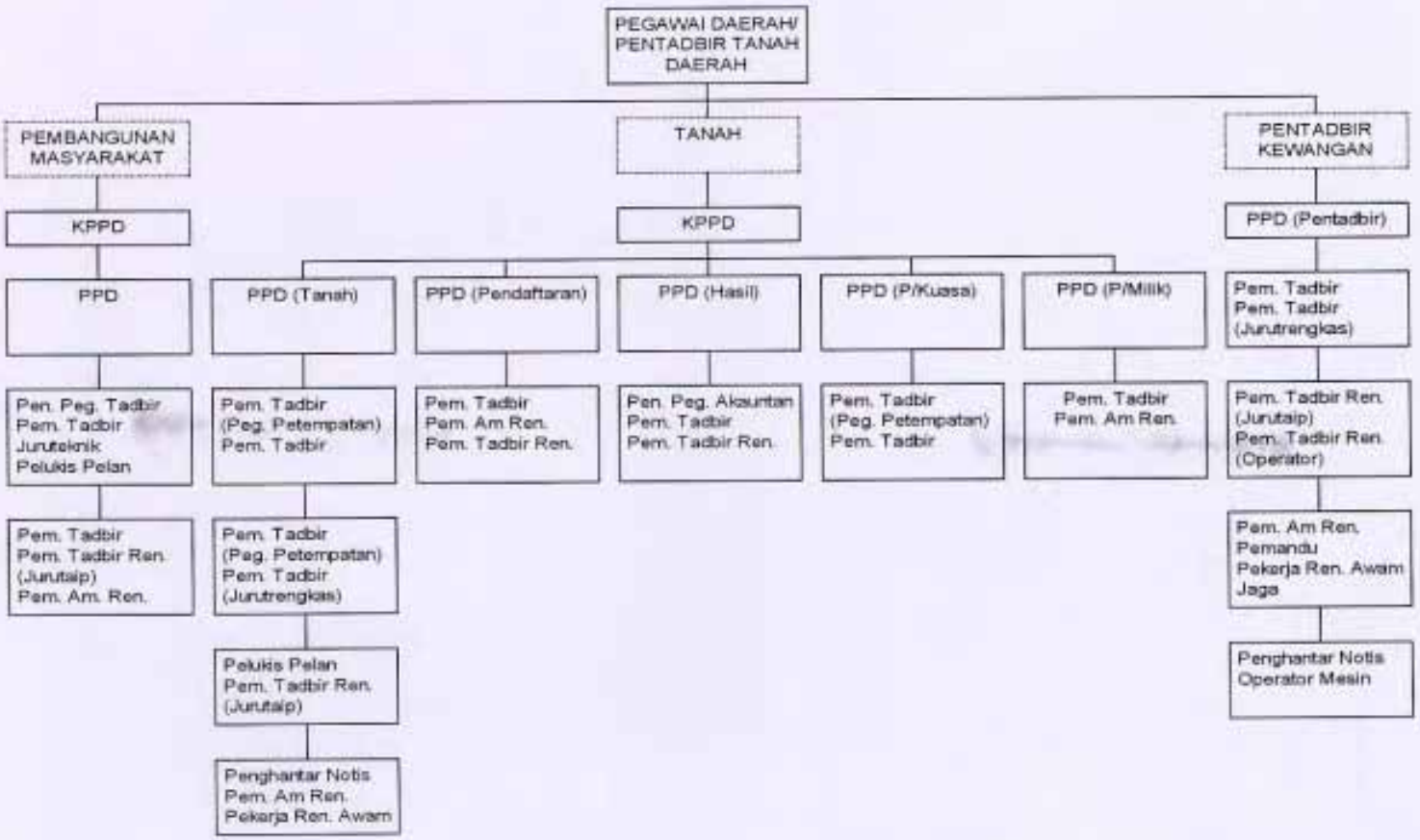
(14) Compared to the Perbadanan, the two local authorities are not as well organised or staffed for the administration of environmental matters. Their present set-up does not provide for a dedicated environmental unit to look after environmental issues such as water quality management, control of pollution and other related matters. Environmental matters within the MPSJ are handled by the Urban Services Department while within the MDS this is not indicated within its structure. Nevertheless, the latter has requested for secondment of an officer from the Department of Environment to assist in the matter but to date this position has not been filled.

8.2.2.5 District and Land Office

(1) As outlined earlier, the catchment of the Putrajaya lake is to be found within the two districts of Petaling and Sepang. The District and Land Office (PTD) of these two districts represent the most important agency for administration at the district level and have as their main function the co-ordination of implementation of projects and programmes at the district level and the administration and management of land. This is reflected in the structure of the two PTDs as shown in Figures 8.2.10 and 8.2.11. In general, PTDs are structured to administer the functions of Development, Land Administration and General Administration.

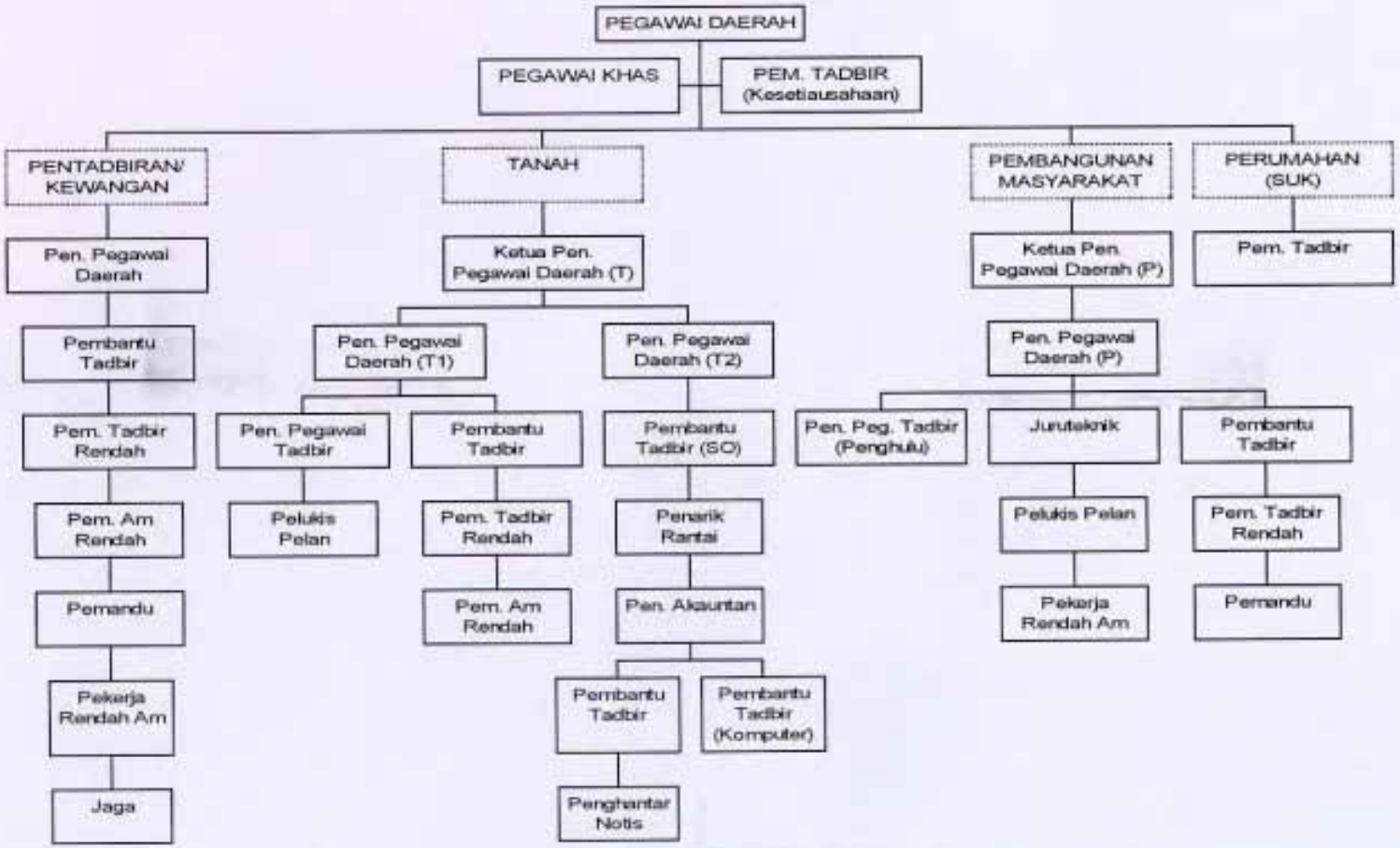
(2) All PTDs come under the purview of the State Secretary and have as one of their main functions, the co-ordination and control of activities and works that have been planned to be implemented by various departments and agencies operating at the district level. The importance of the office is reflected by the fact that although projects may be planned at the state or federal level these are ultimately implemented at the district level. The mechanism for co-ordination of development programmes and projects is through the Jawatankuasa Pembangunan Daerah or District Committee for Development which is Chaired by the District Officer. This Committee has as its members, representatives of Parliament and the State Assembly as well as heads of public agencies and departments at the district level.

FIGURE 8.2.10 : STRUKTUR ORGANISASI PEJABAT DAERAH/TANAH PETALING



Nota : KPPD - Ketua Penolong Pegawai Daerah
PPD - Penolong Pegawai Daerah

FIGURE 8.2.11 : STRUKTUR ORGANISASI PEJABAT DAERAH/TANAH SEPANG



(3) An equally important function of the PTDs is in the administration and management of land. The process of land conversion (involving a change in land use) or application for land, generally goes through the PTDs who act to obtain the views and comments of various public agencies and departments and forward these to the Office of Land and Mines (PTG). The latter has the responsibility to submit such applications to the MMKN which makes the final decision on whether to approve or reject such requests.

(4) In relation to land matters, the PTDs play an important role, since any application for change in land use status or in the application of land is first made known to the office. They are also the "custodian" of state land since they have been given the responsibility to ensure that such land is not illegally used or converted without the permission of the state.

8.2.2.6 Federal Agency at State Level

(1) Various Federal Agencies and Departments operate at state level and one of them, the Department of Environment, has relevance to catchment management by virtue of its role in the protection of the environment. Another agency, the Sewerage Services Department, does not operate at state level but has regional offices which cover more than one state. Its importance in relation to catchment management is in the approval of sewerage services for developments in an area. Related to this is the development and management of sewerage services which has largely been privatised to Indah Water Konsortium for most areas in the country.

(i) ***Department of Environment (JAS)***

(2) An important agency for catchment management, of the Federal Government that also operates at state level, is the Department of Environment (JAS). The department has the function to enforce the provisions of the *Environmental Quality Act 1974* (EQA).

(3) The functions of JAS in the state, includes Prevention (through the requirements for Environmental Impact Assessment or EIA), Enforcement (in relation to contravention of the provisions of the EQA and its subsidiary legislation and to investigate complaints),

Development (covering the assessment and approval of new industrial and related applications, education and others), and General Administration. It has also been proposed that two units be set up to look into matters related to coastal management and river management, the latter being in response to the *Selangor Waters Management Authority Enactment 1999* (Figure 8.2.12).

(4) The department does not operate at district level. However, there has been a request for the secondment of an officer to the Majlis Daerah Sepang in view of the rapid development of the area with the operation of the KLIA and Cyberjaya. To date an officer has yet to be seconded. The department itself is facing a shortage of staff as shown by the number of vacancies within its office.

(ii) ***Sewerage Services Department (JPP)***

(5) The JPP has been given the responsibility to co-ordinate and approve the development of sewerage services in the country under the Sewerage Services Act 1993. The actual responsibility of development and management of sewerage works has since been privatised to Indah Water Konsortium (IWK), although in the past sewerage services was a responsibility of local authorities. Except for the areas managed by Perbadanan Putrajaya, IWK has taken over responsibility in the local authority areas of Sepang and Subang Jaya.

(6) Although IWK has taken over the development and management of sewerage works in local authority areas, they have so far not been effective in the implementation of new capital works. Refurbishment of old sewage treatment plants have been undertaken while treatment works for new development areas have generally been borne by private developers. In this regards, the role of the JPP in ensuring that treatment plants approved in the catchment area of the Putrajaya Lake meet standards that are effective for water quality management is crucial.

FIGURE 8.2.12 : CARTA ORGANISASI
JABATAN ALAM SEKITAR NEGERI SELANGOR

8.2.2.7 Putrajaya Lake Catchment Management Committee

(1) The Putrajaya Lake Catchment Management Committee (PLCMC), is an administrative committee that was formed in January 1997 to address the concerns of developments in the catchment outside of the Perbadanan Putrajaya, which have potential to affect water quality of the lake. The Committee has no legal powers since it does not operate under any specific law but the recommendations made by the Committee may be effected through the various responsible government agencies and departments by way of laws in which they have jurisdiction.

(2) The Committee is made up of various government agencies and department, the three local authorities of Sepang, Subang Jaya and Putrajaya as well as two of the major stakeholders, Universiti Putra Malaysia (UPM) and Malaysian Agricultural Research and Development Institute (MARDI). It is chaired by the Secretary General of the Ministry of Agriculture.

(3) The Terms of Reference of the Committee (see Appendix 8.2.1) is as follows:

1. Menyelaras kawalan pembangunan sekitar kawasan tadahan di luar Putrajaya, khususnya yang melibatkan kawasan IOI, UPM, MARDI dan TNB.

   To co-ordinate the control of development in the catchment areas outside Putrajaya, in particular in the areas occupied by IOI, UPM, MARDI and TNB.

2. Memastikan penggunaan tanah sekitar kawasan terlibat adalah bersesuaian bagi menjamin dan memelihara kualiti air di kawasan terlibat termasuk yang akan mengalir masuk ke Tasik Putrajaya.

   To ensure suitable land-use in the areas concerned to safeguard and maintain the desirable water quality in the concerned areas as well as for outflows into Putrajaya Lake.

3. Mengubal dasar dan peruntukan undang-undang berkaitan dengan *drainage discharge* ke kawasan tadahan yang mampu merangka sebarang ancaman pencemaran daripada berlaku; dan

To formulate policies and legislation that can regulate drainage discharge from the catchment area against any potential pollution.

4. Menentukan lain-lain peruntukan dan langkah yang perlu diambil dalam usaha memelihara kualiti air kawasan tadahan dan tasik supaya harus berada ditahap yang tinggi.

   To undertake such other measures and provisions that are necessary to ensure that the water quality is maintained at high standards in the catchment area and the Lake.

(4) The members of the Committee, chaired by the Secretary-General of the Ministry of Agriculture, are as follows:

1. Ketua Setiausaha Kementerian Pertanian (Chairman)
2. Setiausaha Kerajaan Negeri Selangor
3. Unit Perancang Ekonomi
4. Jabatan Perancang Bandar dan Desa, Malaysia
5. Jabatan Perancang Bandar dan Desa, Selangor
6. Jabatan Alam Sekitar, Malaysia
7. Jabatan Alam Sekitar, Selangor
8. Pengarah Tanah dan Galian, Selangor
9. Majlis Perbandaran Subang Jaya
10. Majlis Daerah Sepang
11. Universiti Putra Malaysia
12. Putrajaya Holdings Sdn Bhd
13. Perbadanan Putrajaya
14. Jabatan Pengairan dan Saliran, Malaysia
15. Jabatan Pengairan dan Saliran, Selangor
16. MARDI
17. Penasihat Undang-undang Kementerian Pertanian

(5) The Committee is supported by a Technical Committee chaired by the Director General of JPS (see **Appendix 8.2.2**). This Technical Committee has as its members, representatives of local authorities, state agencies and departments as well as all the major stakeholders within the catchment.

8.2.2.8 Stakeholders

(1) Within the catchment of the Putrajaya Lake are to be found several stakeholders who own land within the catchment and in one way or another have potential to affect the catchment and hence generate impacts to the lake system. The major stakeholders include institutions such as, UPM, MARDI and Tenaga Nasional Berhad (TNB) who own a gas fired power plant and Universiti Tenaga Malaysia (UNITEN) within the catchment.

(2) Private land owners and developers include IOI Berhad (the owners of a recreational, residential and hotel complex), West Country Sdn Bhd (owns land adjacent to Putrajaya with a view to convert this for residential development) and Cyberview Sdn Bhd who are involved in the development of Cyberjaya.

8.2.3 Management and Control Systems

Protection of the water quality of the Putrajaya Lake system requires effective management of its catchment to minimise the generation of pollutants and to prevent the entry of undesirable pollutants in excessive amounts into the lake. In this regards three main areas of management and control may be considered crucial to protect the lake system. These being:

- Planning and land use control,
- Drainage management and control, and
- Environmental management and pollution control.

8.2.3.1 Planning and Land Use Control

(1) Planning and land use control of areas within the catchment of the lake system represents one of the most important mechanisms for protection of water quality of the lake. This is due to the impact that a change in land use has on runoff which affects drainage and the hydrology of the river and lake system. In addition, activities that are undertaken in an area as a result of changes in land use that is allowed, has potential to generate pollutants which affect water quality.

(2) Presently, land use is determined by the State except in Putrajaya. Changes in land use in all other areas require the approval of the State and generally all proposals for land conversion are referred to the MMKN for approval (see Section

8.2.2.2). Co-ordination of such submissions is by the PTG. While various agencies and departments at district and state level are expected to give their views with respect to such applications for conversion of land, the final decision on the application rests with the MMKN. Local authorities like other agencies and departments may present their views and comments. Nevertheless, requirements recommended by the agencies and departments may be imposed as conditions of approval.

(3) Private stakeholders within the catchment of the Putrajaya Lake may be expected to apply for a change in land use if these changes provide commercial and economic gains. For instance, West Country Sdn Bhd owns prime land just adjacent to Putrajaya. Plans are being made to convert the land for mixed residential development. Such changes in land use have implication to the lake catchment and hence lake water quality.

(4) Structure plans for both the MDS and MPSJ have been prepared but for most areas, local plans that detail out the approved land use for the area are being prepared but only for some areas. It is expected that this process will take time to be completed and gazetted. As such these areas are still open to applications for ad-hoc conversion of land which is undesirable since this has the potential to prevent effective land use control and management.

(5) Within the areas of Putrajaya and Cyberjaya, master plans for land use have been prepared. The master plans that have been prepared are very detailed and planning controls are strictly enforced and effectively managed. Local plans are also being made for various development areas within Putrajaya and these are expected to be gazetted and made mandatory for future developments. In this regards, changes to land use to those approved in the local plans are not expected to be a major issue for the two areas.

(6) Based on an analysis of the mechanism of planning control and land use management it is clear that, except for the Putrajaya area, the State is the approving authority for conversion of land and hence the type of land use within the local authority areas of Sepang and Subang Jaya. The absence of local plans within

the two areas precludes effective land use control by the two local authorities since ad-hoc applications for conversion may still be made to the State.

8.2.3.2 Drainage Management and Control

(1) The responsibility for control and management of drainage rests with local authorities (urban drainage), the JPS (main drainage systems and rivers), and the JKR (roadside drains). Each has its own area of responsibility but not necessarily co-ordinated.

(2) With regards to catchment management, the JPS has generally taken the lead for managing rivers where issues of stream flow, water availability and use, and flood management arise, whereas local authorities and the JKR are more concerned about drainage where it affects the local authority area or project (such as road) respectively. Drainage from the latter two are ultimately directed to main drainage systems or rivers which are taken to be the responsibility of the JPS.

(3) Changes in runoff arising as a result of urban development or the implementation of projects, such as roads, affects receiving streams and rivers since large increases in runoff can lead to flooding downstream and land clearing can lead to increase in soil erosion and sediment transport to rivers. Hence controls on developments within a catchment is important. Presently the JPS is consulted where land development projects are proposed. The department imposes conditions for runoff management and flood control and requires that developers submit appropriate plans for its approval.

(4) Even though the JPS has control on runoff and manages flooding, it has no jurisdiction over the quality of water that is discharged. As discussed earlier, runoff generated from local authority areas and from roadside drains of JKR roads, have the potential to carry sediment and other pollutants. Drainage of such pollutants into the river system and ultimately into the lake has potential to affect its water quality. Control of such discharges into main drains and rivers is an issue that needs to be addressed if protection of the Putrajaya Lake is to be achieved.

8.2.3.3 Environmental Management and Pollution Control

(1) Agencies which have direct responsibilities for environmental management and pollution control are essentially the local authorities and JAS. The areas of responsibility of these two authorities and the relevant laws which are enforced have been discussed earlier and in Section 8.1.6 of the Legislative study. Other agencies, such as the JPP and IWK play an indirect role in the planning and implementation of sewerage programmes and works to ensure that sewage is properly treated prior to its discharge.

(2) The control of pollution within the catchment of the Putrajaya Lake may be discussed with respect to point and non-point sources of pollution. Both sources of pollution are to be found within the lake catchment and the present mechanism for the control of these sources is outlined in the following.

(i) ***Points sources***

(3) Point sources of pollution are associated with the discharge of sewage from residential, recreational and institutional developments. There is no significant industrial sources of pollution within the catchment. For new developments, sewage is presently quite well controlled since it is required by the JPP that proper sewerage systems be constructed and operated. Except for Putrajaya, no centralised sewerage system is operated in the area of the catchment outside of Putrajaya. Individual sewerage systems are used which cater to the needs of specific developments.

(4) Within Putrajaya, sewerage systems are presently constructed by the Perbadanan and this could be the case for operation and maintenance. However, the latter may be privatised or managed by IWK. For all other areas that have been taken over by IWK, they are to be operated and managed by the Consortium.

(5) In relation to the quality of discharge, JAS has set standards of discharge for treated effluents under the *Environmental Quality (Sewage and Industrial Effluents) Regulations 1979*. These standards apply to both sewage and industrial effluents. More stringent standards may be

set if this is required to safeguard the quality of lake water.

(6) The Perbadanan is proposing to adopt more stringent standards of discharge to control water pollution of the lake by way of regulations to be made under the EQA 1974.

(7) It is to be noted that the powers to set standards for discharges and water quality is within JAS but the department is a Federal agency and only operates up to state level. It does not have offices at the district or local authority levels and this limits to some extent its effectiveness in enforcement.

(ii) ***Non-Point sources***

(8) Non-point sources of pollution present problems for control as often no specific laws have been made to control them. Following are some of the non-point sources of pollution and the legislative controls that are currently applied.

a) Soil Erosion and Sedimentation

(9) Soil erosion is expected to represent the most important problem that has potential to affect the quality of lake water as a result of silt carried into rivers and the lake. Earthworks and construction activities result in the opening up of land and expose them to erosion. From the legal standpoint, control is mainly through the *Earthworks By-laws* which are enforced by local authorities.

(10) Other agencies such as JAS and the JPS do this administratively. For example, JAS requires project proponents whose EIAs have been approved, to prepare an Environment Management Plan (EMP) as a condition of EIA approval. It has also issued a guideline on the format of the EMP to be prepared (See Appendix 8.2.3).

(11) Based on the legislative analysis undertaken, improvements to the *Earthworks By-laws* is required to

strengthen and make it more effective. In addition, enforcement of the by-laws is important.

b) Pollutants in Runoff

(12) Pollutants in runoff include nutrients from agricultural areas, and sediment and chemicals (such as oils) from roads, car parks and sources from urbanised areas. There are no specific laws governing the control of quality of runoff and this is presently done administratively, such as the requirement for silt traps and sedimentation basins. The responsibility for the management of runoff rests with the local authority and the respective agencies such as the JKR and other developers or owners of the property.

(13) These non-point sources can be significant sources of pollutant inputs into the catchment and represent areas of control that are currently not adequately addressed.

8.2.4 Assessment of Institutional and Administrative Framework for Catchment Management

8.2.4.1 A review of the administrative set-up and institutional arrangements for management of pollution from the Putrajaya Lake Catchment has been made and following are some of the preliminary conclusions that can be drawn:

8.2.4.2 Effective planning and Landuse Control in Putrajaya and Cyberjaya areas

The control of planning and land use management within areas such as Putrajaya and Cyberjaya is expected to be effective since detailed Master Plans have been drawn up for the two areas. In the case of Putrajaya, the mechanism and set-up for control and management of planning is well organised compared to those of the other local authority areas. Although Cyberjaya lies within the MDS it nevertheless is a special case since control of planning and development is within the authority of the Multi Media Development Corporation. Cyberview Sdn Bhd, the developer of Cyberjaya, is bound to adhere to the conditions imposed by the Corporation.

8.2.4.3 No local plans for the areas outside Putrajaya and Cyberjaya

Areas that fall outside of the two areas are managed by the respective local authorities, MDS and MPSJ. Structure Plans have been prepared for the two local council areas but Local Plans have yet to be made and gazetted for those areas within which the Putrajaya Lake Catchment lies. Ad-hoc applications for conversion of land is likely to occur and the final decision to allow such conversions lies with the state and not with the local authority.

8.2.4.4 No integrated approach to drainage

With respect to drainage, there is no integrated approach to the issue since the responsibilities for drainage lies with the JPS, the local authorities and other agencies such as the JKR and other developers. All runoff and discharges into drainage systems ultimately flow into rivers which is the main source of water for the lake. Integrated management of drainage and the river system is important and needs to be addressed. Control of quality of runoff represents one of the issues that need to be given attention.

8.2.4.5 MDS and MPSJ have inadequate set-ups for management of environmental issues

The two local authorities, MDS and MPSJ, have set ups that are similar except that the latter is more organised and better staffed, it being a municipality. However, compared to the Perbadanan, the organisational structure of both local authorities for effective management of environmental issues such as control of water pollution, runoff management and others that have an effect on lake water quality, are generally inadequate. They lack suitable staff for undertaking such responsibilities.

8.2.4.6 No effective control of non-point sources of pollution

The powers of JAS to control pollution are wide but effectively these are mainly directed towards point sources of pollution. Its jurisdiction with respect to non-point sources of pollution, such as soil erosion and siltation, contaminants in runoff and others are limited (see Section 8.1.6.7 of Legislative review). These matters are better addressed by local authorities since these issues relate to activities which fall within their jurisdiction. Hence, local authorities need to be structured to manage and control non-point sources of pollution which are expected to be

important in the management of the Putrajaya Lake Catchment. The enforcement functions of local authorities should not be confined to those related to public health (such as domestic waste or pest management), traffic and businesses but expanded to include environmental quality management.

8.2.5 Proposed Institutional Arrangement For Administration

8.2.5.1 The present arrangements for control of planning and management of land use, control and management of drainage, and environmental management and pollution control suggests that significant improvements to the present arrangement are necessary for effective management of the Putrajaya Lake Catchment.

8.2.5.2 A review of the legislative provisions for management suggests that the *Selangor Waters Management Authority Enactment 1999* (SWMAE) provides a mechanism for integrated management of the catchment (see Section 8.1.7 of the Legislative review). The structure of the Selangor Waters Management Authority (SWMA) has been proposed and is shown in Figure 8.2.13**.** It includes the formation of Regional Offices which are to be responsible for the management of entire river basin systems, such as the Sg. Langat of which the Sg. Chuau is a tributary.

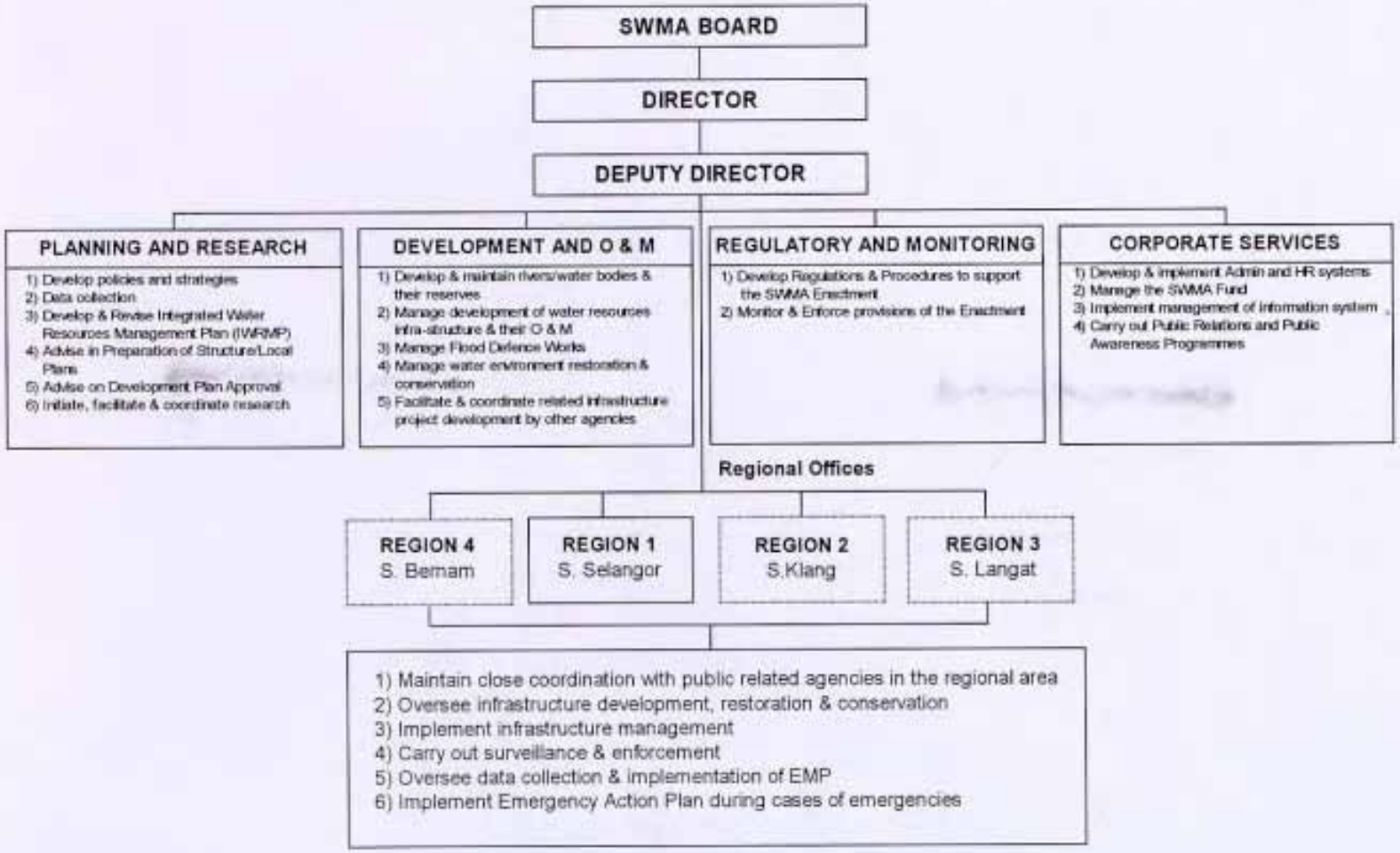
8.2.5.3 Based on an analysis of the powers within the Enactment and the structure of the Authority, the following conclusions can be drawn:

(1) The SWMAE is a comprehensive law and provides the legal basis for management of a catchment since the issue of water is a state matter;

(2) The Enactment provides for the management of water resources on a catchment basis in a sustainable and integrated manner. It allows for a sub-catchment approach to be adopted for the management of the Putrajaya Lake Catchment;

(3) The Enactment provides the best basis for water quality management since it has provision for prescribing water quality standards and the imposition of control on total

FIGURE 8.2.13 : PROPOSED SWMA ORGANISATIONAL STRUCTURE AND FUNCTION



pollutant load discharges into the catchment. It provides the means to control more effectively non-point sources of pollution and complements the provisions under the EQA for point sources;

(4) There are provisions within the Enactment to ensure that land use within a catchment is reviewed by the Authority before approval for conversion is given. The Authority has a Planning role which is to advise on Structure and Local Plans that are prepared;

(5) Drainage planning and development, which is presently not approached in an integrated manner, can be more effectively addressed by the Authority since it has authority over an entire catchment;

8.2.5.4 Based on the above analysis, it can be summarised that the SWMA has both the legal clout and the administrative linkages to undertake overall catchment management effectively. The contribution from other existing agencies to catchment management will continue to complement those of the Authority, since it is expected that the actual exercise of enforcement can remain the function of the local authorities and other existing agencies who already have such powers or can be delegated such powers under the SWMA.

8.2.6 Recommendations

8.2.6.1 The findings from the Institutional Review have shown that catchment management is best undertaken by the SWMA which has the legal powers and institutional set-up for undertaking this. It is thus recommended that overall management of the Putrajaya Lake Catchment be the responsibility of the SWMA in the long term as part and parcel of the overall management scheme for the Sungai Langat River Basin which is to be managed by the proposed Regional office of the SWMA.

8.2.6.2 However, the Authority is at its infancy and although a Director has been appointed, the formation and full functioning of the Authority has yet to be made known. As such interim measures for catchment management are recommended to be taken until such time that the Authority has specific plans and programmes for the management of the Sg. Langat Catchment. It is

anticipated that the Perbadanan and the other local authorities will continue to take lead roles in the management of the catchment.

8.2.6.3 Sub-Catchment Management

(1) Section 46 (1) of the SWMAE allows the SWMA to establish local area management committees and stakeholders' groups to work with the SWMA. In this context, it is proposed that a Sub-Catchment Management Committee (SCMC) be appointed in the interim to advise the Authority on matters relating to the management of the Putrajaya lake catchment, of which the Sg. Chuau, a tributary of the Sg. Langat, is the main river system. The SCMC will operate as a sub-committee of the SWMA Technical Committee.

(2) The members of the Committee is to comprise of technical experts from the various government agencies and departments, and also a representative from the stakeholders. The Committee is suggested to be chaired by the State Secretary or his representative and comprise the following members:

Chairman: State Secretary/Representative

Members: SWMA
Drainage and Irrigation Department
Department of Environment
Town and Country Planning Department
Perbadanan Putrajaya
Majlis Perbandaran Subang Jaya
Majlis Daerah Sepang
Jabatan Kerja Raya
Sewerage Services Department
Representative of Stakeholder's Consultative Committee

Secretariat: SWMA / Perbadanan Putrajaya's Lake & Wetlands Unit

(3) The Perbadanan has the greatest stake in preserving the water quality in the Lake and has all the necessary resources to manage the Putrajaya Area to meet the desired water quality objectives of the Lake. Thus, it is recommended that the

functions of the Committee be confined to the following main issues related to integrated management of the catchment, *for the areas outside Putrajaya*.

- Provide advise relating to land use planning and management in the areas, that are necessary for integrated management of the catchment;
- Provide advise relating to drainage control and management;
- Provide advise relating to pollution control and management;
- Provide advise on the monitoring programme required for the integrated management of the catchment;
- Provide advise on the enforcement action required to be taken; and
- Provide advise on the works required to support the integrated management of the catchment.

A draft TOR for the Committee has been drawn-up (see Appendix 8.2.4). The Committee has to be formalised by the SWMA eventually.

With the above institutional arrangements the micro-management of the catchment areas within Putrajaya will be the responsibility of the Perbadanan, whereas those outside will be the responsibility of the SWMA. *However, from the macro-management perspective of the Langat River Basin, the Perbadanan still has to meet the water quantity and quality requirement, downstream of the Putrajaya Lake catchment, set by the SWMA.*

(4) It is to be noted that the Committee is not intended to override the functions of the various local authorities and other government agencies but to act as a forum for consultative discussions and decisions to ensure integrated catchment management. It is still left to the various local authorities as well as other government agencies to enforce matters related to their areas of jurisdiction.

(5) It is anticipated that the Perbadanan will play a lead role in the Committee since it is the best placed to do so by virtue of its

technical and financial strength and commitment to ensure that the lake is protected. In this context it is proposed that the management of the catchment within Putrajaya be the responsibility of the Perbadanan, while the SWMA be responsible mainly for the catchment outside of the Perbadanan.

(6) The formation of a Lake and Wetlands Unit within the City Planning Department of the Perbadanan is expected to enhance the effectiveness of the Sub-Catchment Management Committee as discussed in the following.

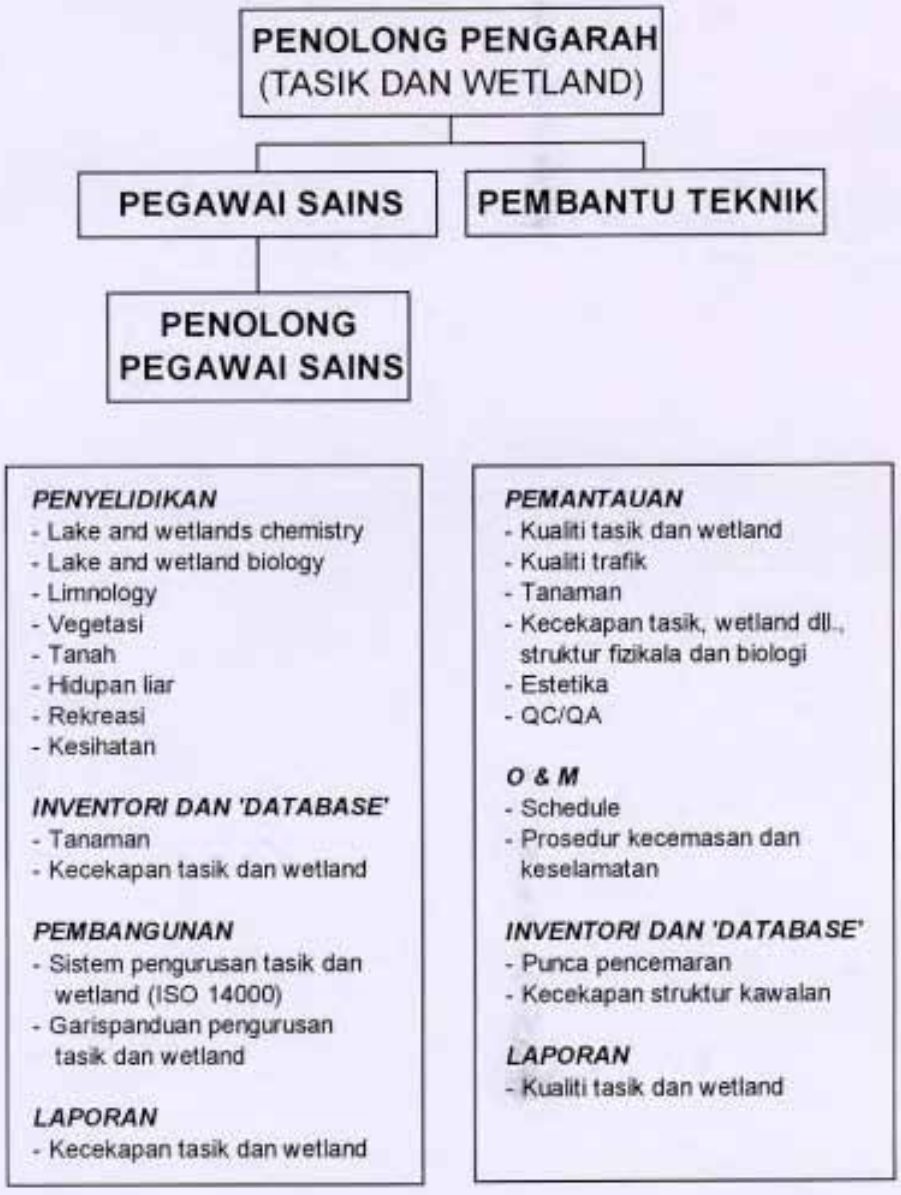
8.2.6.4 Role of Perbadanan Putrajaya's Lake & Wetlands Unit

(1) The Perbadanan Putrajaya has formed a Lake and Wetlands Unit within its City planning Department (see section 8.2.2.4 (6)) with the responsibility for managing and maintaining the lake and the wetlands. It has been assigned the task to plan, co-ordinate and implement programmes for monitoring and undertake research. The general structure and functions that have been assigned to the Unit is outlined in Figure 8.2.14.

(2) The SCMC, has representatives from various government departments and local authorities. The Committee is effectively a co-ordinating body and as such it would not be expected that matters relating to the collection, collation and analyse data (such as water quality, waste inventory, source emissions and other information that is required for integrated catchment management), be undertaken by the Committee. It is best that these be undertaken by a supporting "unit" that has capabilities and facilities to undertake such works. The centralisation of data and information to enable ease of collation, analysis and interpretation is thus recommended.

(3) In this regards it is recommended that the Perbadanan Putrajaya's Lake and Wetlands Unit (PLWU) either wholly or jointly with the SWMA be assigned the overall task of monitoring the implementation of the Catchment Management Plan and acting as the Secretariat to the SCMC. It should be assigned the task to collect, collate, analyse and manage the information that is generated from the monitoring, source inventory and model studies. It would be required to provide technical reports to the SCMC on matters such as:

FIGURE 8.2.14 : CARTA CADANGAN UNIT TASIK DAN WETLAND JABATAN PERANCANGAN BANDAR



- trends in water quality and causes of changes,
- source inventory updates (point and non-point), and
- biological changes affecting the lake and wetlands.

(4) Overall co-ordination of monitoring of the catchment is also proposed to be delegated to the Perbadanan and be the responsibility of the Unit. It is to be assisted by the Hydrology Unit of the Perbadanan in providing information on drainage, lake and river hydrology and related hydrogeological information. Agencies such as JAS, JPS, JPP, MPSJ, MDS and other technical departments and various stakeholders are expected to contribute to the information database that is kept by the PLWU.

8.2.6.5 Stakeholders' Participation

(1) The involvement of stakeholders in catchment management is important and a platform for their participation is proposed both at the Sub-Catchment Management Committee as well as the Stakeholders' Group which will be in the form of a Stakeholders' Consultative Committee (SCC). It is recommended that the SCC be chaired by the Director of SWMA or his/her representative.

(2) The SCC is recommended to be formed as it presents a separate forum for members to discuss matters that affect them. The involvement of all stakeholders in the Sub-Catchment Management Committee is too unwieldy and will not provide adequate opportunity for effective discussion of such matters. Awareness and understanding of the decisions of the SCMC is important to ensure that stakeholders will contribute positively to catchment management. The SCC should meet at least annually but also as and when issues are referred to it by the SCMC.

8.2.6.6 Structure For Catchment Management

(1) Figure 8.2.15 outlines the suggested arrangement for catchment management between the Selangor Waters Management Authority (SWMA), the Sub-Catchment Management Committee (SCMC) and the Stakeholders' Consultative Committee (SCC). It is anticipated that these new committees

will replace the present ad-hoc Putrajaya Lake Catchment Management Committee (PLCMC) and its technical arm that has been set up to manage the catchment.

(2) The suggested Terms of Reference for the SCMC and the SCC are outlined in **Appendix 8.2.4 and 8.2.5** of this report.

8.2.6.7 Putrajaya Lake Catchment Management Committee

(1) As outlined earlier, the PLCMC was formed as an ad-hoc committee to co-ordinate the control of development within the catchment with the aim of safeguarding the quality of water in the Putrajaya Lake. Until the formation of the new SCMC by the SWMA, it is suggested that the PLCMC continues with its present function.

(2) Similarly, the Technical Committee assisting the PLCMC, chaired by the Director General of JPS, is to continue its function until such time that the new SCMC is formed by the SWMA. It is then proposed that both these present committees be disbanded upon the coming into operation of the two new committees.

8.2.6.8 Organisational Strengthening

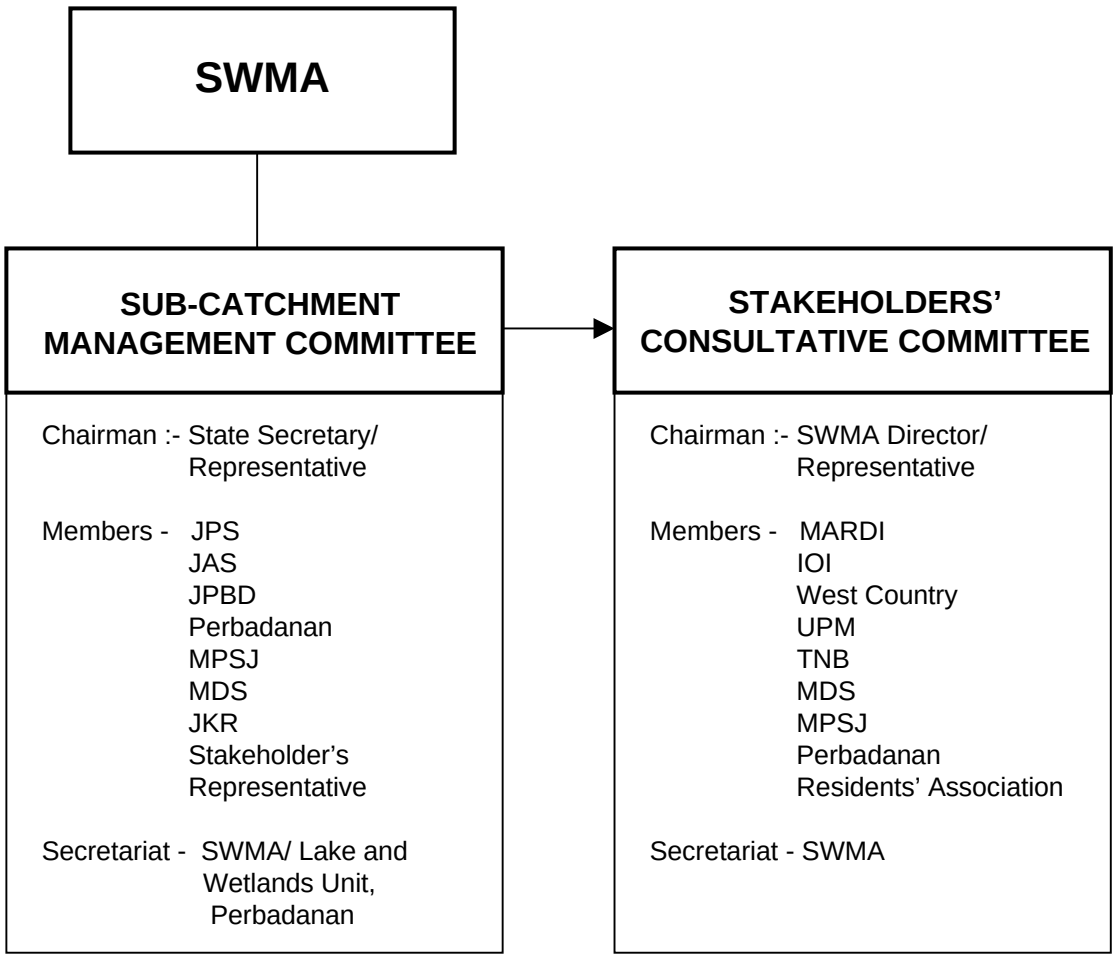
(1) The recommendations for integrated catchment management require that the tasks for management be assigned to various organisations and parties. These relate to planning, operation and implementation of various programmes and projects in the catchment area besides the enforcement of laws within which they have jurisdiction. Some of these works require that certain organisations be strengthened while others may require that new functions be added.

(2) Following are recommendations relating to new functions and manpower requirements for various organisations.

(i) Perbadanan Putrajaya

(3) The additional duties proposed for the Lake and Wetlands Unit of the City Planning Department requires that the Unit be beefed up and reorganised to consist of at least 2 graduate officers (besides the Penolong Pengarah) instead of 1 as presently. At least one of these two officers is to have substantial training in chemistry or chemical

FIGURE 8.2.15 : PROPOSED STRUCTURE FOR PUTRAJAYA LAKE CATCHMENT MANAGEMENT



engineering, while the other is to have substantial training in aquatic science. The rationale for this is change is to ensure effective analysis and interpretation of data and information that is required to support the SCMC.

(4) It is also suggested that the position of the Penolong Pegawai Sains be substituted for an additional position of a Pembantu Teknik since the former is irrelevant in the presence of the latter. These technicians should be in possession of at least a diploma in science or engineering. The role of the technicians in monitoring, collection and collation of data and information is substantial, and unless they are conducted efficiently, the analysis and interpretation of data would not be effectively carried out.

(ii) Majlis Daerah Sepang

(5) The status of MDS should be upgraded to that of a Municipality in view of the large area of jurisdiction and the anticipated increase in development that is expected in the presence of the KLIA, Cyberjaya, Salak Tinggi and other developments in the area. With this status the organisational structure and budget of the local authority can be enhanced and increased.

(6) In view of the importance of land use planning and land use control in catchment management, it is recommended that additional staff be assigned to the Planning Division. An additional Planner and a Technical Assistant is recommended to be added to the present set-up in the MDS in view of the heavy work load in the MDS.

(7) As urban drainage is an important function of the local authority, it is also suggested that an additional Engineer and a Technical Assistant be recruited into the Engineering and Buildings Division of the MDS. The engineer is to give special attention to drainage and earthworks as well as undertake other responsibilities that may be assigned to him/her.

(8) In view of the importance of environmental management in the catchment, it is recommended that an Environmental Unit comprising of a graduate Environmental Officer and

a Technical Assistant be added to the present set-up of the MDS.

(9) In order to shorten the timeframe for operation of these units, it is recommended that trained or experienced staff be given preference. All the above additional staff may be recruited through secondment from other pertinent government agencies and departments.

(iii) Majlis Perbandaran Subang Jaya

(10) The area of catchment which is within the jurisdiction of MPSJ is small and confined to the MARDI area. Although the Municipality is well structured, it still lacks graduate officers to manage its planning and look after its engineering works.

(11) For the purposes of catchment management of the Sg. Chuau, there is no necessity for any increase in staff for the Municipality. However, over the long term if catchment management is to be extended to whole river systems, it is recommended that additional graduate staff be recruited to strengthen the Planning and Engineering Departments of the MPSJ. The formation of an Environmental Department should also be given due consideration.

(iv) Other Government Departments and Agencies

(12) Organisational strengthening of other government departments and agencies is presently not required.

(v) Stakeholders

(13) While stakeholders are expected to be involved in catchment management, such as monitoring of discharges, this is expected to be undertaken by contractors appointed by the stakeholders. Ensuring that there is control on the quality of the monitoring that is undertaken is an important aspect that needs to be given due consideration. Results of the monitoring is expected to be submitted to the Secretariat of the SCMC for collation and analysis.

8.2.7 REFERENCES

1. Ramadas, K. & Associates (1999) - Formulation of Regulations and Guidelines For The Control of Activities And Use of The Lake And Other Water Bodies In Putrajaya. June 1999.

2. Perunding Utama Sdn Bhd (1998) Putrajaya - Legislative Review for Environmental Management. October 1998.

3. Jurutera Perunding Zaaba Sdn Bhd (1999) - Institutional and Legal Study for The Establishment of a State Government River Management Institution. Draft Final Report. June 1999.

4. Kassim Chan Management Consultants (1997) - Organisation Scheme and Compensation Scheme/Salary Structure Study for Perbadanan Putrajaya. Phase 1 Final Report. March 1997.

5. Kassim Chan Management Consultants (undated) - Job Description for the City Planning Department.

6. Kassim Chan Management Consultants (undated) - Job Description for the City Development Department.

7. Kassim Chan Management Consultants (undated) - Job Description for the Top Management Section and the Corporate Services Department.

APPENDIX 8.1.1
LIST OF LEGISLATION RELEVANT TO THE MANAGEMENT OF THE PUTRAJAYA LAKE CATCHMENT AREA

1. Waters Act, 1920
2. Geological Survey Act, 1974
3. Irrigation Areas Act, 1953
4. Street, Drainage and Building Act, 1974
5. The Forest Act, 1984
6. The National Land Code, 1965
7. The Drainage Works Act, 1954
8. The Fisheries Act, 1985
9. Environmental Quality Act, 1974
10. Land Conservation Act, 1960
11. Town and Country Planning Act, 1976
12. Local Government Act, 1976
13. Selangor Waters Management Authority Enactment, 1999
14. Mining Enactment, 1929
15. Sewerage Services Act, 1993

MUNICIPAL RULES

1. Planning Control (General) Rules
2. Earthworks By-Laws
3. Stray Animal By-laws
4. Licensing of Trades, Businesses and Industries By-laws
5. Refuse Collection, Removal and Disposal By-Laws
6. The Public Cleansing By-Laws
7. Anti-Litter By-laws
8. Parks By-laws

APPENDIX 8.1.2
REVIEW OF THE SELANGOR WATERS MANAGEMENT ENACTMENT, 1999

1.0 Introduction

The Selangor Waters Management Authority Enactment, 1999 (SWMA) was passed by the State Legislature in April 1999. The enforcement of the Enactment is pending announcement by the State Authorities. The setting up of the SWMA is being given priority by the State and it is expected that the Authority will be set up by the end of this year. The SWMAE is a comprehensive law that will allow the State of Selangor to manage all its water resources in a sustainable and integrated manner. It applies to all water sources wholly within the State of Selangor, except those which are wholly within Putrajaya.

2.0 Main Objective of the Enactment

The main objective of the Enactment is to enable the State of Selangor to manage all its water resources in a sustainable and integrated manner. Water resources include rivers, wetlands, lakes, coastal waters, ground water and other similar water bodies. The Enactment will be implemented by the establishment of an Authority (the SWMA). The Authority is empowered to act to safeguard water resources and enable utilisation of water resources at a rate that will continuously provide adequate water supply to the State whilst ensuring the continued proliferation of flora and fauna dependant on the water resources. The Menteri Besar is appointed the Chairman of the Authority to reflect the importance of the functions to be undertaken under the Enactment. A Technical Committee shall also be instituted to provide advice to the SWMA and to ensure better coordination with several related agencies.

3.0 Focus of the SWMA

The focus of the SWMA is on the following areas. Details are described below.

(a) Integrated management of water resources
(b) Protection of water sources

(c) Promotion of water use efficiency and conservation
(d) Mitigation of floods
(e) Privatisation
(f) Environmental protection
(g) Increased stakeholder participation
(h) Enforcement

3.1 Integrated Management of Water Resources

The SWMA provides for the integrated management of all water resources in the State. The various sources of water form part and parcel of the total hydrological cycle. They are best managed as an integrated whole. The SWMA is vested with wide ranging powers to develop, control, regulate and manage all water sources in the State. It can also collect, collate and disseminate data and conduct research on water resources. Other public agencies such as the Land Administrator, local authorities and Mining Inspector will have to consult and obtain the approval of the SWMA before commencing any works in a water source.

In order to allow the SWMA sufficient time to build itself up a gradual extension of its powers over water sources is provided by enabling the Authority to designate any water source as a designated water source. Upon such designation the Authority shall draw up and implement an integrated management plan for the sustainable utilisation of the resources therein. The Sg. Langat Catchment does not appear to be a current priority to the SWMA. The need to give greater priority to this catchment in view of the expected accelerated development will have to be impressed upon the SWMA by the Perbadanan.

3.2 Protection of Water Sources

The SWMA can take action to control and regulate any activity that may have an adverse impact on any water source. Such action includes licensing, imposition of safety standards, fitting of approved equipment, monitoring and regulation of any works and the control of activities on the surface of water bodies. Reclamation and coastal works will have to be approved by the SWMA. The SWMA can delineate and control activities on catchment areas, river reserves, flood zones and problem soil areas. Where other public authorities (such as local authorities) have powers vested under

different laws the SWMA may request any of these authorities to consult the SWMA regarding any development proposed within catchment areas or in any river reserves.

3.3 Promotion of Water Use Efficiency and Conservation

The SWMA provides for the development of efficient and best management practices in order to ensure that water is used efficiently and wastage is reduced. Various mechanisms are provided including measures for establishment of realistic water pricing, development of incentives for conservation such as reduced water charges for water conserved, encouragement of water re-cycling in both public and private sectors, resale of conserved water and the control of the exploitation of ground water. The taking of any water including any diversion, abstraction and extraction or the discharge of any substance or return of water into any water source will be subject to the control of the Authority.

3.4 Mitigation of Floods

The SWMA, in consultation with the relevant public authority, which in this case will be the Drainage and Irrigation Department, will take effective steps to prevent and mitigate the impact of disasters caused by flooding. This will include mitigating the impact of drainage discharges in sensitive areas, coordination at the state level between the DID, SWMA and other state and federal authorities to ensure that drainage discharges are minimized and runoff from development and urban schemes is contained on site. The SWMA may impose a charge on any discharge into any water source including a return of water.

3.5 Privatisation

Any services and undertaking of the SWMA may be privatised. The SWMA shall, as far as possible, play a regulatory, promotional and developmental role. The latter role may be undertaken especially when any multi purpose development is undertaken, such as a dam that is built for water, hydro electric power and irrigation. There are sufficient safeguards provided to ensure that the private entity plays its role effectively.

3.6 Environmental Protection

The SWMA, in order to achieve its objective of sustainable use and development of water resources, will play a pro active role in environmental matters. The Environmental Quality Act, 1974 (EQA) will continue to apply. The SWMA will have to coordinate its actions and consult the Department of Environment on EIA's performed in compliance with the EQA. The SWMA may, in areas where the EIA does not apply, require that the project proponents or by itself carry out an EIA so as to allow better control over ongoing activities in river basins and other water sources. Compliance with EIA conditions will be strictly enforced. Rules and regulations including standards and guidelines for reservoir, dams and other activities which would have an impact on water resources, riparian users and river dependent in-stream resources will be formulated.

3.7 Increased Stakeholder Participation

There will be enhanced opportunities for all stakeholders including NGO's and other public agencies to participate in the planning and establishment of river basin management schemes. The SWMA itself will have to encourage the formation and operations of stakeholder groups so as to allow grass roots participation in the management of river basins. This will also encourage better enforcement through self regulation.

3.8 Enforcement

The SWMAE has instituted a system of incentives for compliance and disincentives for noncompliance and self-regulation, as far as possible. In the event that these measures do not work then adequate powers and stiff penalties are provided for enforcement to ensure that the water resources are safe-guarded.

4.0 Conclusion

The Enactment will result in the repeal of the Waters Act, 1920 in so far as the latter Act applies to Selangor. Transitional provisions have been incorporated to allow for smooth implementation. Effective implementation of the Enactment will revolutionise the management of water resources in the State. Selangor will be a pioneer in the better governance of water resources which is facing serious threats from development. Trans-boundary rivers will have to be jointly managed with the other relevant states. The SWMAE provides for detailed rules and regulations to be drawn up that will enable the SWMA to regulate all matters pertaining to the integrated management of water resources in the State.

APPENDIX 8.2.1

Nota Ringkas
Jawatankuasa Khas Pengurusan Kawasan Tadahan Tasik Putrajaya
(Putrajaya Lake Catchment Management Committee)

Bagi menyelaras pengurusan kawasan tadahan Putrajaya untuk menjamin kualiti air yang mengalir ke Tasik Putrajaya, Jawatankuasa Khas Pengurusan Kawasan Tadahan Tasik Putrajaya telah ditubuhkan di Kementerian Pertanian selaras dengan arahan Ketua Setiausaha Negara pada Januari 1997. Jawatankuasa ini, dengan keahliannya seperti di Lampiran A berkembar dipengerusikan oleh Ketua Setiausaha Kementerian.

Syarat-syarat Rujukan Jawatankuasa ini yang telah ditetapkan adalah bagi:-

i. menyelaras kawalan pembangunan sekitar kawasan tadahan di luar Putrajaya, khususnya yang melibatkan kawasan IOI, UPM, MARDI dan TNB;

ii. memastikan pengunaan tanah sekitar kawasan terlibat adalah bersesuaian bagi menjamin dan memelihara kualiti air di kawasan terlibat termasuk yang akan mengalir masuk ke Tasik Putrajaya;

iii. mengubal dasar dan peruntukan undang-undang berkaitan dengan *drainage discharge* ke kawasan tadahan yang mampu merangka sebarang ancaman pencemaran daripada berlaku: dan

iv. menentukan lain-lain peruntukan dan langkah yang perlu diambil dalam usaha memelihara kualiti air kawasan tadahan dan tasik supaya harus berada ditahap yang tinggi.

Dalam hubungan ini satu Jawatankuasa Teknikal bersabitan juga telah ditubuhkan yang dipengerusikan oleh Ketua Pengarah Jabatan Pengairan dan Saliran.

Bahagian Pembangunan Sumber dan Institusi
Kementerian Pertanian Malaysia

29 Jun 1999

APPENDIX 8.2.2
MEMBERS OF THE PUTRAJAYA LAKE CATCHMENT MANAGEMENT TECHNICAL COMMITTEE

1. Ketua Pengarah (Chairman)
Jabatan Pengairan dan Saliran Malaysia
Jalan Sultan Salahuddin
50626 Kuala Lumpur

2. Ketua Pengarah
Jabatan Alam Sekitar Malaysia
Tingkat 13, Wisma Sime Darby
Jalan Raja laut
Kuata Lumpur
(UP: Puan Wan Ramlah Haji Wan lbrahim)

3. Ketua Pengarah
Jabatan Perancang Bandar dan Desa
Jalan Cenderasari
50646 Kuala Lureput
(UP: Puan Asmi Mustafa)

4. Penasihat Undang-undang
Kementerian Pertanian Malaysia

5. Presiden
Perbadanan Putrajaya
Pusat Pentadbiran Kerajaan Persekutuan Putrajaya
43000 Kajang

6. Yang Di Pertua
Majlis Perbandaran Subang Jaya
USJ 5, Persiaran Perpaduan
47610 Subang Jaya
(UP: En. Alias Miskon)

7. Yang Di Pertua
Majlis Daerah Sepang
Tingkat 1, Bangunan Tun Aziz
43900 Bandar Baru Salak Tinggi
Sepang
(UP: En. Asraruddin Jaafar)

8. Pengarah, Jabatan Pengairan dan Saliran
Negeri Selangor Darul Ehsan
Tingkat 5, Blok Podium Selatan
Bangunan Sultan Salahuddin Abdul Aziz Shah
40626 Shah Alam

9. Pengarah
Jabatan Perancangan Bandar dan Desa
Negeri Selangor Darul Ehsan
Tingkat 5, Blok Podium Selatan
Bangunan Sultan Salahuddin Abdul Aziz Shah
40646 Shah Alam
(UP: En. Che Mohamad Che Idris)

10. Pengarah
Jabatan Alam Sekitar
Negeri Selangor
Tingkat 5, Bangunan Sultan Salahuddin Abdul Aziz Shah
40626 Shah Alam

11. Pengarah Tanah dan Galian
Negeri Selangor
Tingkat Bawah
Bangunan Sultan Salahuddln Abdul Aziz Shah
40626 Shah Alam

12. Pengarah Bahagian Pembangunan
Universiti Putra Malaysia
43400 UPM
Serdang, Selangor
(UP: Hj. Zakaria A. Hamid)

13. Pengurus Besar
MARDITECH Corporation Sdn. Bhd.
19-21-2, SHL Business Centre,
Jalan SR 8/1, Serdang Raya
43300 Seri Kembangan
Selangor
(UP: En. Ibrahim Osman)

14. Pengurus Besar
Putrajaya Holdings Sdn. Bhd.
Pusat Pentadbiran Kerajaan Persekutuan Putraiaya
43000, Kajang
(UP: En. Norazmi Mohamed Nordin)

15. Pengurus Besar Steysen.Janaletrik Serdang
Tenaga Nasional Generation Sdn. Bhd.
Bag Berkunci 211
43009 Kajang
(UP: En. Izam Ismail)

16. Pengurus
Industrial Oxygen Incorporated Bhd.
Bangunan IOI, No. 8, Jalan Kenari 5
Bandar Puchong Jaya
47100 Puchong
(UP: En. David Tan)

17. Pengurus
West Country Sdn. Bhd.
33rd Floor, Menara Multi Purpose
Capital Square
No. 8. Jalan Munshi Abdullah
50100 Kuala Lumpur
(UP: En. Martin Chung)

18. Pengarah Hidrologi
JPS Malaysia
Cawangan]alan Ampang
68000 Jalan Ampang
(UP: En. Azmi Mohd. Jaafri)

19. Ketua Pegawai Eksekutif
Cyberview Sdn. Bhd.
Level 7, Menara 1
Faber Towers
Jalan Desa Bahagia
Taman Desa
58100 Kuala Lumpur

20. Angkasa GHD Engineering Sdn. Bhd.
(UP: Ir. Khor Chai Huat)

APPENDIX 8.2.3
DOE'S GUIDELINE FOR THE PREPARATION OF AN ENVIRONMENT MANAGEMENT PLAN
(Plan, Implement, Check and Review)

I INTRODUCTION

a. Project Concept, which has been approved by Local Authority.
b. Work Implementation Schedule

II POLICY

a. Company's objective in environmental protection.
b. Management's long term commitment in ensuring compliance to the environmental requirements.

III ORGANISATION CHART/ BUDGET

a. List of names of top management and officers responsible for managing the environmental aspects (this list would need to be updated if there are any changes)
b. Name of consultants or accredited labs which conducts the monitoring work or are responsible for carrying out the analysis or preparing the environmental report
c. Frequency and training related to environment and safety which is provided to the staff
d. The estimated financial budget provided for the implementation of the Environmental Management Plan

IV ENVIRONMENTAL REQUIREMENTS

a. Conditions of Approval of EIA and Appeal for Change of Condition (if any)
b. The related standards and regulations
c. Monitoring reports and frequency
d. Copies of any other approvals or written permission which has been issued by DOE

V MONITORING PROGRAMS

a. Baseline study of water quality and noise levels before commencement of work as a comparison to the monitoring data which will be submitted later
b. Monitoring stations have to be selected and indicated in the map – justifications of the site selection would have to be given
c. Effluent discharge points would have to be shown
d. Monitoring frequency
e. Sampling Methods

VI SIGNIFICANT IMPACTS AND POLLUTION CONTROL MEASURES

a. The significant impacts of the project would have to be submitted, along with the specific control measures such as the proposed location of silt traps, the slopes of which have been identified as erosion – prone and the proposed specific slope protection, selection of air emission control etc.
b. Identification of wastewater treatment systems and air pollution control along with a summary of the concept would have to be submitted
c. "Abandonment Plan" if the project is abandoned

VII ENVIRONMENTAL CONTINGENCY PLAN

a. Actions to be taken in the event of an emergency such as land slides, oil spill or hazardous chemical spill and failure of any of the pollution control equipment
b. The organisation that will be involved in managing the plan

APPENDIX 8.2.4
TERMS OF REFERENCE FOR SUB-CATCHMENT MANAGEMENT COMMITTEE

The following is the suggested Terms of Reference for the Sub-Catchment Management Committee:

1. To review land use and development plans in the catchment areas outside Putrajaya and to advise the Selangor Waters Management Authority (SWMA), and such other local and state authorities or agencies, on acceptable land use or development for the areas, so as to support the integrated management of the Lake catchment.

2. To advise the SWMA and such other local and state authorities on acceptable land use for the structure and local plans that are to be prepared for the areas;

3. To review and assess water quality trends in the streams, wetlands and the Lake and to make recommendations for pollution control and enforcement action in the areas, where this is necessary to protect the water quality;

4. To review the monitoring programme and make recommendations for changes in the areas, where they are required to enhance catchment management;

5. To review and advise on acceptable physical and engineering works in the areas, which are necessary for water quality management and catchment protection; and

6. To advise on stakeholders' participation in catchment management and to refer matters that affect stakeholders to the Stakeholders' Consultative Committee for review and feedback.

APPENDIX 8.2.5
TERMS OF REFERENCE FOR STAKEHOLDERS' CONSULTATIVE COMMITTEE

The following are the suggested Terms of Reference for the Stakeholders' Consultative Committee (SCC):

1. To review matters related to management of the Putrajaya Lake Catchment that is referred to the SCC by the Sub-Catchment Management Committee (SCMC);

2. To provide feedback or decisions to the SCMC on matters referred to it where this requires a decision of members of the SCC; and

3. To consult, where necessary, with members of the public, land owners or residents' association and such other individuals or groups on matters (referred by the SCMC) related to management of the Putrajaya Lake Catchment that are likely to affect them.

CHAPTER 9

COSTING, BUDGET AND FUNDING

9.0 COSTING, BUDGET AND FUNDING

9.1 INTRODUCTION

9.1.1 The management and monitoring programs, together with the implementation requirements specified in this Catchment Development and Management Plan will involve financial expenditure. Thus, there is a need to compile the indicative costs associated with the programs for the preparation of an indicative budget for the proposed implementation schedule in the Plan.

9.1.2 There is also a need to identify and assess the possible funding sources and funding options, respectively, so that an equitable funding mechanism, in line with the policy of the Plan, can be agreed upon by all stakeholders in the catchment.

9.2 INDICATIVE COSTS ESTIMATES

9.2.1 Introduction

9.2.1.1 The Consultant has attempted to provide cost estimates under two categories, viz. one-off capital expenditure (development expenditure), and their concomitant operating overheads (operations and maintenance costs). *(NB: Where operating and maintenance costs include salaries, only the basic salary costs have been computed. It is beyond the scope of this study to compute EPF, SOCSO and other employee benefits).*

9.2.1.2 Wherever possible, the specialists have tried to obtain the cost estimates in the case of development expenditure from third party suppliers. Where this was not possible, the specialists have prepared estimates based on their own past experience.

9.2.1.3 The indicative cost estimates for the following study components have been compiled:

- Water quality
- Hydro-geology
- Hydrology
- Drainage
- Sewerage
- ICMS

- Institutional

9.2.2 Water Quality Study

9.2.2.1 The water quality specialist has proposed a ***Water Quality Monitoring Program*** to be implemented, over a 3-year period, upon the implementation of the Lake Catchment Management Plan.

9.2.2.2 The details of the Program are specified in the *Putrajaya Lake Management Guide.* A total of 81 water level recorders and 23 water gauging stations have been proposed to be installed over the 3-year period.

9.2.2.3 Table 9.1 gives the summary of the indicative Capital, Operations & Maintenance (O & M) and water quality sampling costs associated with the Water Quality Monitoring Program over the 3-year period. The details are given in Appendix 9.1.

Table 9.1 Indicative costs associated with the Water Quality Monitoring Program for a 3-year period.

Period	Year-1 (RM)	Year-2 (RM)	Year-3 (RM)	Total (RM)
Capital	335,000	425,000	335,000	1,095,000
O & M	5,000	15,000	20,000	40,000
Sampling	725,000	1,815,000	2,446,400	4,986,400

9.2.3 Hydro-geological Study

9.2.3.1 The hydro-geologist has indicated that a groundwater well field of 6 wells can be developed, downstream of the main dam. The timing for the construction of the well field depends on the needs of Putrajaya for the groundwater.

9.2.3.2 The development of the well field may be implemented as part of the irrigation master plan for Putrajaya.

9.2.3.3 The indicative capital and annual O & M costs associated with the development and operations of the groundwater well field are given below. The details are given in Appendix 9.2.

- Capital cost – RM144,000
- O& M cost – RM16,433/year

9.2.4 Hydrological Study

9.2.4.1 The hydrologist has proposed that a hydrological monitoring station network be installed to support the management of the Putrajaya Lake, upon the implementation of the Lake Catchment Management Plan.

9.2.4.2 A total of five (5) automatic rainfall measuring stations, seven (7) automatic streamflow gauging stations, five (5) automatic water level measuring stations and six (6) automatic groundwater level monitoring stations have been proposed. The locations of the stations are given in Figure 3.1.10 in Chapter 3.

9.2.4.3 The indicative capital and annual O & M costs associated with the setting-up and operations of the hydrological monitoring station network are given below. The details are given in Appendix 9.3.

- Capital cost – RM881,00
- O& M cost – RM69,000 /year

9.2.5 Drainage Masterplan Study

9.2.5.1 The drainage engineer has proposed that mini-wetlands and vegetated landscape drainage corridors be constructed as part of the drainage system improvement in the areas outside Putrajaya.

9.2.5.2 Table 9.2 gives the indicative capital and annual O & M costs associated with the drainage system improvement works for the areas outside Putrajaya, together with pertinent remarks on their respective implementation schedule. The details are given in Appendix 9.4.

Table 9.2 Indicative costs associated with the drainage system improvement works in the areas outside Putrajaya.

Stakeholder Area	Capital Cost	Annual O&M cost	Remarks on implementation schedule
1. MARDI - Drainage corridor improvement (6.9 km)	RM8,942,400	RM56,000	To be implemented as part of the SKVE, ERL and MARDI's development in the area
2. UPM - Drainage corridor improvement (6 km)	RM7,776,000	RM60,000	To be implemented as part of UPM's development
3. IOI - 3 Nos. mini-wetlands	RM72,000	RM14,400	To be implemented as part of the development for the proposed ponds.
4. West Country - 1 No. mini-wetland	RM31,500	RM6,300	To be implemented as part of West Country's development
5. Cyberjaya - 6 water quality enhancement ponds provided with GPTs	RM81,000	RM16,200	To be implemented as part of Cyberjaya's development
Total	RM16,902,900	RM152,900	

9.2.6 Sewerage Masterplan Study

9.2.6.1 The sewerage engineer has proposed that a sewage effluent discharge monitoring program be implemented, upon the implementation of the Lake Management Plan. He has also proposed that the existing sewerage treatment plants for two student hostels in UPM, Kolej 8 (1097 PE) and Kolej 9 (1038 PE), be upgraded as soon as possible.

9.2.6.2 The indicative cost for the upgrading works for the two student hostels in UPM is **RM854, 000** at RM400/PE.

9.2.6.3 The monitoring program will require the carrying out of sampling and testing of the sewage effluent discharge by the following four stakeholders in the catchment – MARDI, UPM, IOI and Cyberjaya.

9.2.6.4 The indicative annual operational costs associated with the operations of the sewage effluent discharge monitoring program, for the 4 stakeholders, are given below. The details are given in Appendix 9.5.

- UPM – RM55,800/year
- MARDI – RM37,200/year
- IOI – RM9,300/year
- Cyberjaya – RM37,200/year

Total: RM139, 500/year

9.2.7 ICMS Study

9.2.7.1 The ICMS team has recommended the purchase of a GIS program and a personal computer for the installation and training in the use of the low-level ICMS, developed as part of this study, *upon the completion of the study.*

9.2.7.2 The team also recommended that a decision be made, *after a trial period of 6 months*, on the refinement of the low-level ICMS and conversion to the Perbadanan's SiCAD GIS.

9.2.7.3 The indicative cost associated with the above two recommendations are as follows:

(a) Installation and Training in the use of low-level ICMS

- GIS program (ArcView) – RM11,500
- Personal Computer – RM 9,000

Total RM20, 500

(b) Refinement and conversion to SiCAD GIS

- Consulting cost – **RM200,000** (see Appendix 9.6 for details)

9.2.8 Institutional Study

9.2.8.1 The institutional specialist has recommended the recruitment of additional 6 staff for the Majlis Daerah Sepang (MDS), as part of the institutional strengthening exercise, upon the implementation of the Lake Catchment Management Plan.

9.2.8.2 He has also indicated that there are expenses associated with the holding of meetings of the Lake Management Committee and Stakeholders Consultative Committee.

9.2.8.3 The indicative costs associated with the above two items are as follows. The details are given in Appendix 9.7.

- Staff recruitment for the MDS – RM141,000/year
- Meeting expenses – RM 26,000/year

Total RM167, 000/year

9.3 INDICATIVE IMPLEMENTATION BUDGET

9.3.1 Table 9.3 gives the indicative implementation schedule and budget for the various programs recommended by the respective specialists for an implementation period of 3 years.

9.3.2 From Table 9.3 it can be seen that the total indicative 3-year total cost of the recommended programs is about RM 26.6 million, made up of about RM20.3 million for capital expenditure and about RM6.3 million for O&M expenditure. The bulk of the capital expenditure, about 83%, is for drainage improvement

PUTRAJAYA LAKE CATCHMENT DEVELOPMENT AND MANAGEMENT PLAN

	CAPITAL COSTS (RM)					O & M COSTS (RM)					REMARKS
PROGRAMS	**Year 1**	**Year 2**	**Year 3**	**Unscheduled**	**Total**	**Year 1**	**Year 2**	**Year 3**	**Unscheduled**	**Total**	
1. Water Quality Monitoring Network	335,000	425,000	335,000		**1,095,000**	725,000	1,815,000	2,446,400		**4,986,400**	O & M Cost includes
(Refer App. 9.1 for details)											sampling costs
2. Development of groundwater well field				144,000	**144,000**				16,433	**16,433**	To be implemented
(Refer App. 9.2 for details)											when needed
3. Hydrological Monitoring Network	881,000	0	0	881,000	**881,000**	69,000	69,000	69,000		**207,000**	
(Refer App. 9.3 for details)											
4. Drainage Improvement Cost											To be implemented
(a) MARDI				8,942,400	8,942,400				56,000	56,000	as part of each
(b) UPM				7,776,000	7,776,000				60,000	60,000	stakeholder's
(c) IOI				72,000	72,000				14,400	14,400	development program
(d) West Country				31,500	31,500				6,300	6,300	
(e) Cyberjaya				81,000	81,000				16,200	16,200	
(Refer App. 9.4 for details)					**16,902,900**					**152,900**	
5. Sewerage Improvement/Monitoring Cost											
(a) UPM	854,000				854,000	55,800	55,800	55,800		167,400	
(b) MARDI	240,000				240,000	37,200	37,200	37,200		111,600	
(c) IOI	0				0	9,300	9,300	9,300		27,900	
(d) Cyberjaya	0				0	37,200	37,200	37,200		111,600	
(Refer App. 9.5 for details)					**1,094,000**	139,500	139,500	139,500		**418,500**	
6. ICMS Installation and Improvement	20,500	200,000			**220,500**						
(Refer App. 9.6 for details)											
7. Institutional Strengthening (manpower)						167,000	167,000	167,000		**501,000**	
(Refer App. 9.7 for details)											
TOTAL COSTS	**2,330,500**	**625,000**	**335,000**	**17,927,900**	**20,337,400**	**1,100,500**	**2,190,500**	**2,821,900**	**169,333**	**6,282,233**	

which cost about RM16.9 million. Also, the bulk of the O&M expenditure, about 81%, comes from the water quality sampling costs over the 3-year period.

9.3.3 The following programs are recommended to be implemented in the first year upon approval of the Lake Catchment Management Plan:

- Water quality monitoring network
- Hydrological monitoring network
- Sewerage effluent discharge monitoring
- Sewerage improvement at UPM
- ICMS Installation
- Institutional Strengthening (additional manpower for MDS)

9.3.4 The total indicative capital expenditure in the first year is about RM2,330,500 and that for O&M expenditure is about RM1,100,500. 74.5% of the capital expenditure in the first year, i.e. RM1,735,000 has been estimated for the upgrading of the sewerage treatment facilities for the two student hostels in UPM (RM854,000) and for the hydrological monitoring network (RM881,000). 69% of the O&M expenditure in the first year, i.e. RM725, 000, is for the cost of the water quality sampling.

9.4 FUNDING

9.4.1 Funding Sources

9.4.1.1 The three main sources of funding for the successful implementation of the Consultant's recommendations are:

- The Federal Government
- The Selangor State Government
- The individual stakeholders

9.4.1.2 The Federal Government, through Perbadanan Putrajaya as the main stakeholder in the catchment, will have to bear most of the cost associated with the implementation of the recommended programs within the 70% of the catchment where Putrajaya lies.

9.4.1.3 The Selangor State Government, through its respective agencies and local authorities, will have to bear additional costs arising

from increased regulatory supervision and maintenance in the 30% of the Lake catchment area that lies within the State, to meet the desired environmental objectives for the catchment.

9.4.1.4 The individual stakeholders in the catchment will have to bear additional costs as a result of complying with the additional regulatory requirements imposed in the catchment to meet the desired environmental objectives for the catchment.

9.4.2 Funding Principles

9.4.2.1 The Federal Government, as the main project proponent for the development of Putrajaya, and the primary beneficiary from the development will most probably have to bear all additional costs arising from the implementation of the recommended programs in the Lake Catchment Management Plan, that would not normally have been expended by the Selangor State Government and the individual stakeholders under normal circumstances.

9.4.2.2 However, the Selangor State Government and the individual stakeholders also benefit from the development of Putrajaya, through increased economic activities and appreciation of property values due to their proximity to Putrajaya and its high quality living environment. Thus, it is not unfair to expect the Selangor State Government and the individual stakeholders in the catchment to bear part of the additional costs arising from the implementation of the recommended programs and compliance with the high regulatory requirements set to meet the desired environmental objectives for the Putrajaya Lake and its catchment.

9.4.2.3 An equitable approach has to be found through negotiations between the Federal and State Government of Selangor. As for the individual stakeholders in the catchment the following approach maybe acceptable:

(a) For *existing and committed developments* in the catchment it would be fair to compensate the respective affected stakeholders for the additional costs burden incurred by them as a result of complying with the requirements of the programs in the Lake Catchment Management Plan.

(b) For all uncommitted developments the additional cost associated with complying with the requirements of the programs in the Lake Catchment Management Plan shall be borne by the respective stakeholders, as part of compliance with the regulatory requirements. *The regulatory provisions for the management of the development in the Lake catchment will be further strengthened by the designation of the Putrajaya Lake Catchment as a designated sub-catchment under the SWMA Enactment, as recommended by the Consultant.*

9.4.3 Funding For The Recommended Programs

9.4.3.1 Based upon the above funding principles the Consultant has identified the possible funding sources for the recommended programs. They are given in Table 9.4 and are discussed below.

9.4.3.2 Water Quality Monitoring Network

The Perbadanan Putrajaya is the primary stakeholder of Putrajaya Lake and is also the body responsible for the monitoring of the water quality in the Lake. Thus, the most likely funding source for this program is the Perbadanan Putrajaya.

9.4.3.3 Development of groundwater well field

The groundwater well field can be developed by the Perbadanan Putrajaya if required to meet the irrigation and other water needs in Putrajaya. Thus, the funding source for this program will be the Perbadanan Putrajaya.

9.4.3.4 Hydrological Monitoring Network

Similar to the water quality monitoring network the hydrological monitoring network is an essential requirement for the management of the Putrajaya Lake. Thus, the most likely funding source for this program is the Perbadanan Putrajaya.

TABLE 9.4 POSSIBLE FUNDING SOURCES

FUNDING SOURCE	PROGRAMS	CAPITAL COSTS (RM)	O & M COSTS (RM)	REMARKS
Perbadanan Putrajaya	1. Water Quality Monitoring Network	1,095,000	4,986,400	To be implemented in Year 1 over a 3-year period
	2. Development of groundwater well field	144,000	16,433	To be implemented when needed
	3. Hydrological Monitoring Network	881,000	207,000	To be implemented in Year 1
	4. Sewerage Effluent Monitoring		418,500	To be implemented in Year 1 over a 3-year period
	5. ICMS Installation	20,500		To be implemented in Year 1 for a trial period of 6 months
	6. ICMS Improvement	200,000		To be decided based on 6 months trial
TOTAL COST TO BE BORNED BY PERBADANAN PUTRAJAYA		**2,340,500**	**5,628,333**	
Federal Government	1. Sewerage Improvement Cost	1,094,000		Sewerage Improvement in UPM and MARDI to be implemented in Year 1 (subject to negotiation with UPM and MARDI)
	2. Institutional Strengthening		167,000	1. Annual O & M cost 2. To be implemented in Year 1 3. Subject to negotiation with the Selangor State Government
	3. Drainage Maintenance Cost		152,900	Federal Government to fund maintenance program in areas outside Putrajaya
TOTAL COST TO BE BORNED BY FEDERAL GOVERNMENT		**1,094,000**	**319,900**	
Selangor State Government	Institutional Strengthening		167,000	1. Annual O & M cost 2. To be implemented in Year 1 3. Subject to negotiation with the Federal Government
TOTAL COST TO BE BORNED BY SELANGOR STATE GOVERNMENT			**167,000**	
MARDI	1. Drainage Improvement Cost	8,942,400		To be implemented as part of MARDI's development program
	2. Sewerage Improvement Cost	240,000		Subject to negotiation with Federal Government (to be implemented in Year 1)
TOTAL COST TO BE BORNED BY MARDI		**9,182,400**		
IOI	Drainage Improvement Cost	**72,000**		
TOTAL COST TO BE BORNED BY IOI		**72,000**		
West Country	Drainage Improvement Cost	**31,500**		To be implemented as part of each stakeholder's development program
TOTAL COST TO BE BORNED BY WEST COUNTRY		**31,500**		
Cyberjaya	Drainage Improvement Cost	**81,000**		
TOTAL COST TO BE BORNED BY CYBERJAYA		**81,000**		
SKVE	Drainage Improvement Cost**			
TOTAL COST TO BE BORNED BY SKVE PROJECT		**		To carry out drainage improvement in UPM and MARDI areas which are affected by the respective project
ERL	Drainage Improvement Cost**			** Costs cannot be ascertained
TOTAL COST TO BE BORNED BY ERL PROJECT		**		
UPM	1. Drainage Improvement Cost	7,776,000		To be implemented as part of UPM's development program
	2. Sewerage Improvement Cost	854,000		Subject to negotiation with Federal Government (to be implemented in Year 1)
TOTAL COST TO BE BORNED BY UPM		**8,630,000**		

9.4.3.5 Drainage Improvement Program

(1) There is no immediate need for the improvement of the existing drainage systems outside Putrajaya. All of the recommended drainage improvements for the following stakeholders are to be implemented by them, as part of their normal development cost:

- MARDI
- UPM
- IOI
- West Country
- Cyberjaya

(2) There is a need to ensure that the respective project proponents for the SKVE and ERL implement the recommended vegetated landscape drainage corridor in the MARDI and UPM areas, where the SKVE and ERL passes through. There is also a need to ensure that the drainage inlets from the SKVE and ERL to the vegetated landscape drainage corridor are provided with GPTs. The costs for complying with the recommended requirements will most probably be the responsibility of the respective project proponents.

(3) The responsibility for the maintenance of the drainage corridors and mini-wetlands in the public areas lies with the pertinent local authorities, whereas those in the individual stakeholder's areas, such as MARDI, UPM and IOI, should be borne by the respective stakeholders. Since the maintenance funds of local authorities are limited the Federal Government may have to develop and fund specific maintenance programs for identified areas outside Putrajaya.

9.4.3.6 Sewerage Improvement/Monitoring Program

(1) There is an immediate need to upgrade the sewage treatment facilities of two student hostels in UPM. IWK has identified the MARDI and UPM areas as part of the sewerage catchment area to be served by its proposed Kota Perdana/Listari central sewerage treatment plant. However, the exact date of the implementation of the central sewerage treatment plant is not certain. Thus, in the interim there may be a need to upgrade the sewage treatment facilities of the two student hostels in UPM. The cost for the upgrading will most probably have to be borne by both the Federal Government and UPM.

(2) There is a need to conduct additional monitoring of the quality of the sewage effluent discharge coming from the UPM, MARDI, IOI and Cyberjaya, beyond those required by the DOE. The monitoring can be carried out as an additional part of the water quality monitoring program. The cost for this monitoring program will have to be borne by the Perbadanan Putrajaya.

9.4.3.7 ICMS Installation and Improvement Program

(1) There is an immediate need to purchase the ArcView GIS software and a personal computer for the installation and training in the use of the low-level ICMS, developed as part of this study. The cost for the purchase has to be borne by the Perbadanan Putrajaya. The SWMA may also wish to make the same purchase, and send its staff for the training in the use of the low-level ICMS.

(2) After a recommended trial period of 6 months, the Perbadanan Putrajaya may be able to make a decision on whether to proceed with further improvement of the ICMS. The next-stage improvement cost for the low-level ICMS will also have to be borne by the Perbadanan Putrajaya.

9.4.3.8 Institutional Strengthening Program (Additional Manpower)

There is an immediate need to strengthen the existing institutional structure in the Majlis Daerah Sepang to cope with the additional recommended regulatory responsibilities for developments in the areas outside Putrajaya. The costs associated with this program will have to be borne by both the Federal and Selangor State Government.

9.5 COST RECOVERY

9.5.1 The capital expenditure associated with the programs to achieve the environmental objectives and desired living environment for the Lake catchment is not expected to be recovered. However, there is a need for the respective Local, State and Federal authorities to consider the option of implementing a means of cost recovery for the *funding of the maintenance programs* in the Lake catchment area.

9.5.2 A detailed review of the various possible funding options has to be carried out, which is beyond the scope of the current study. The following are two possible equitable policy options for cost recovery:

- Adopt and implement the policy of *"the polluter pays"*
- Adopt and implement the policy of *"the direct beneficiaries pays"*

9.5.3 The *"polluter pays"* policy option will require the respective regulatory authorities to diligently enforce all pertinent legislative provisions for the imposition of fines and penalties for causing pollution in the catchment. This would help to encourage regulatory compliance, in addition to being a source of funds for the maintenance programs. The SWMA Enactment provides for quite drastic fines and penalties for causing pollution in a designated catchment.

9.5.4 The *"direct beneficiary pays"* policy option will require the respective regulatory authorities to find ways to collect funds from direct beneficiaries of the enhanced living environment in the Lake catchment. One such way is to put a surcharge on the assessment rates of the property owners in the Lake catchment areas.

APPENDIX 9.1
DETAILS OF INDICATIVE COST ESTIMATES FOR WATER QUALITY STUDY

1. CAPITAL EXPENDITURE

Setting up Physical Measurement Stations

Year 1 (2000)

(a)	*Installation of 25 Water Level Recorders at GPTs @ RM 5,000.00 each*	*RM 125,000.00*
(b)	*Construction of 7 Gauging Stations (including recorder)@ RM 30,000.00*	*RM 210,000.00*
	Estimated Capital Expenditure in Year 1	***RM 335,000.00***

Year 2 (2001)

(a)	*Installation of 31 Water Level Recorders at GPTs @ RM 5,000.00 each*	*RM 155,000.00*
(b)	*Construction of 9 Gauging Stations (including recorder)@ RM 30,000.00*	*RM 270,000.00*
	Estimated Capital Expenditure in Year 2	***RM 425,000.00***

Year 3 (2002)

(a)	*Installation of 25 Water Level Recorders at GPTs @ RM 5,000.00 each*	*RM 125,000.00*
(b)	*Construction of 7 Gauging Stations (including recorder)@ RM 30,000.00*	*RM 210,000.00*
	Estimated Capital Expenditure in Year 3	***RM 335,000.00***

Total Estimated Capital Expenditure For 3 years	**RM 1,095,000.00**

2. OPERATIONS/MAINTENANCE AND SAMPLING/ ANALYSIS COSTS

A. Operating Costs of Physical Measurement Stations:

Year 1	*RM 5,000.00*
Year 2	*RM 15,000.00*
Year 3	*RM 20,000.00*
Total Operating Costs for 3 years	**RM40,000.00**

B. Water Quality Sampling /Analysis Cost

	Per Month	*Per Annum*
Year 1 (2000)		
100 samples/month @ RM 600.00	*RM 60,000.00*	*RM 720,000.00*
Year 2 (2001)		
250 samples/month @ RM 600.00	*RM 150,000.00*	*RM 1,800,000.00*
Year 3 (2002)		
337 samples/month @ RM 600.00	*RM 202,200.00*	*RM 2,426,400.00*

APPENDIX 9.2
DETAILS OF INDICATIVE COST ESTIMATES FOR HYDROGEOLOGICAL STUDY

1. Capital Expenditure

(1) *Well field development cost*

Construction cost per well

		RM
Mobilisation & Demobilisation		500.00
Drilling/bailing 11½ in dia to 30 ft below ground level		5,500.00
PVC 10 in dia class D x 2 lengths inclusive of installation		1,200.00
Stainless steel screen 10 in dia slot size 0.020 x 3m inclusive installation		3,300.00
Gravel packing-graded 3-6mm quartz sand inclusive of installation		500.00
Well development min 8 hrs		2,500.00
Pumping Test		2,500.00
	TOTAL	16,000.00

Construction costs of 6 wells (including one test well) = *RM96,000.00*

Supply and Installation of submersible pump set per well

		RM
SP5 A4 SUBMERSIBLE PUMP		3,180.00
G. 1.2 in dia class B x 1 length plus fittings		100.00
Dip pipe ¾ in dia class B x 1½ lengths		60.00
4 core cable for power supply		700.00
Control panel		2,600.00
Well clamp cap		160.00
Installation service		1,200.00
	TOTAL	8,000.00

Supply and Installation of 6 submersible pump sets RM8,000.00 x 6 = *RM48,000.00*

Total **RM144,000.00**

(2) *Schedule for completion of works:*

Completion of test well	*7 days*
Completion of 6 production wells	*30 days*
Delivery and installation of pumps	*84 days*

2. Operations and Maintenance Costs

Salary for 1 pump operator
RM800.00 per month = *RM 9,600.00 per annum*

Energy costs (24 hrs. pumping)
RM15.98 per day, = *RM 5,833 per annum*

Well and Pump maintenance = *RM1,000.00 per annum*

Total Annual Maintenance Costs **RM16,433.00 per annum**

(NB: The above maintenance costs will cover the whole well field)

APPENDIX 9.3
DETAILS OF INDICATIVE COST ESTIMATES OF HYDROLOGICAL MONITORING STATIONS

Item		Capital Expenditure (RM)	Annual Operation and Maintenance Costs (RM)
1. Setting up of Automatic Rainfall Station (5 stations)			
i. Continuous Rainfall Sensor	RM 10,000 x 5	RM 50,000	
ii. Housing (Civil Works)	RM 5,000 x 5	RM 25,000	
iii. Data Logger	RM 6,000 x 5	RM 30,000	
iv. Commissioning	RM 4,000 x 5	RM 20,000	
v. Maintenance (1 year)	RM 3,000 x 5		RM 15,000
	Sub Total	RM 125,000	RM 15,000
2. Setting up of Automatic Streamflow Station (7 stations)			
i. Area Velocity Flow Meter (Water Level and Velocity Sensor)	RM 20,000 x 7	RM 140,000	
ii. Housing (Civil Works)	RM 20,000 x 7	RM 140,000	
iii. Data Logger	RM 6,000 x 7	RM 42,000	
iv. Commissioning	RM 5,000 x 7	RM 35,000	
v. Maintenance (1 year)	RM 3,000 x 7		RM 21,000
	Sub Total	RM 357,000	RM 21,000
3. Setting up of Automatic Water Level Station (5 stations)			
i. Water Level Sensor	RM 13,000 x 5	RM 65,000	
ii Housing (Civil Works)	RM 15,000 x 5	RM 75,000	
iii Data Logger	RM 6,000 x 5	RM 30,000	
iv. Commissioning	RM 5,000 x 5	RM 25,000	
v. Maintenance (1 year)	RM 3,000 x 5		RM 15,000
	Sub Total	RM 195,000	RM 15,000
4. Setting up of Automatic Groundwater Level Station (6 stations)			
i. Water Level Sensor	RM 13,000 x 6	RM 78,000	
ii. Housing (Civil Works)	RM 10,000 x 6	RM 60,000	
iii. Data Logger	RM 6,000 x 6	RM 36,000	
iv. Commissioning	RM 5,000 x 6	RM 30,000	
v. Maintenance (1 year)	RM 3,000 x 6		RM 18,000
	Sub Total	RM 204,000	RM 18,000
	GRAND TOTAL	**RM 881,000**	**RM 69,000**

APPENDIX 9.4
DRAINAGE MASTER PLAN

1.0 CAPITAL COSTS ESTIMATES

Cost basis :

i. Planting cost of mini-wetland

Planting of various species of wetland plants, viz. Phragmites Karka, Lepinoria, Eleocharia, Cyperas, Sceleria.

The recommended **planting volume** is 6 plants per sq. metre @ RM1.50 per plant.

ii. Landscaping cost of riparian buffer zone

The per metre/run cost estimates for landscaping the 30 metre riparian buffer zone for the drain corridor improvement are estimated as follows:

Cost of planting 2 rows of shaded trees with materials @ 0.5 metres apart 6 x RM 30 per tree	*RM 180.00 per metre/run*
Cost of planting 3 rows of shrub hedges@ 6 ins. apart with raw materials	*RM 108.00 per metre/run*
Lump turfing: 24 sq. metre/metre run @ RM 15.00 per sq. metre	*RM 360.00 per metre/run*
Total landscaping capital costs	**RM648.00 per metre/run**

The following are the estimated capital costs:

a) Cyberjaya (Flagship Zone)

Planting of wetland
Total pond area to be vegetated = 9,000 sq.m
6 plants/m.sq x 9,000 = 54,000 plants @RM1.50/plant =**RM81,000**

b) I0I Palm Garden Resort Area

Planting of wetland
Total pond area to be vegetated = 8,000 sq.m
6 plants/m.sq x 8,800 = 48,000 plants @RM1.50/plant =**RM72,000**

c) **West Country Area**

Planting of wetland
Total pond area to be vegetated = 3,500 sq.m
6 plants/m.sq x 3,500 = 21,000 plants @RM1.50/plant =**RM31,500**

d) MARDI

Drain Corridor Improvement
Total length of stream = 6.9 km
Length of streams for riparian buffer zone=6.9x2=13.8km
Total cost =13,800m x RM648/m** run =**RM8.9Million**

e) UPM

Drain Corridor Improvement
Total length of stream = 6 km
Length of streams for riparian buffer zone=6x2=12km
Total cost =12000m x RM648/m** run =**RM7.8Million**

2.0 OPERATIONS AND MAINTENANCE COSTS

1. IOI

Item	Descriptions		Per Annum (RM)
a.	Replanting (Assume 20% replanting of the total plants required per year)	20% x 48,000 plant @ RM1.50/plant	14,400

2. WEST COUNTRY

Item	Descriptions		Per Annum (RM)
a.	Replanting (Assume 20% replanting of the total plants required per year)	20% x 21,000 plant @ RM1.50/plant	6,300

3. CYBERJAYA

Item	Descriptions		Per Annum (RM)
a.	Replanting (Assume 20% replanting of the total plants required per year)	20% x 54,000 plant @ RM1.50/plant	16,200

4. UPM

Item	Descriptions		Per Annum (RM)
a.	Grass cutting	RM1000/km @ 6 km @ 2 time/yr	12,000
b.	Desilting (once a year)	6 km @ 1.5m^3/m-run @ RM8/-	48,000
	Total Annual Maintenance Cost		60,000

5. MARDI

	Description		Per Annum (RM)
a.	Grass cutting	RM1000/km @ 7km @ 2 time/yr	14,000
b.	Desilting (Once a year)	7 km @ 1m^3/m-run @ RM6/-	42,000
	Total Annual Maintenance Cost		56,000

APPENDIX 9.5
DETAILS OF INDICATIVE COST ESTIMATES OF SEWERAGE MASTERPLAN STUDY

1. CAPITAL EXPENDITURE

The capital expenditure budget for UPM is based on the following estimated combined flows:

		PE	Cost
i.	Kolej 8	1097 PE	438,800
ii.	Kolej 9	1038 PE	415,200
	Total	**2,135 PE**	**854,000**

@ RM 400.00 per PE

2. OPERATING AND MAINTENANCE COSTS

The monitoring programme as recommended by the Sewerage specialist will necessitate carrying out testing and sampling by the following stakeholders with their attached estimated cost burdens on a 4 monthly basis.

SET A : Sampling and Testing RM300/sample SET B :Sampling and Testing RM550/sample								
Development	Nos. Of Location	Month					RM	
		1		2	3	4		
		SET A	SET B	SET A	SET A	SET B	Set A	Set B
MARDI	4	8	8	4	4	4	3600	8800
UPM	6	12	12	6	6	6	5400	13200
IOI	1	2	2	1	1	1	900	2200
CYBERJAYA	4	8	8	4	4	4	3600	8800
TOTAL	15	30	30	15	15	15		
ESTIMATED COST (RM)		25500		4500	4500	8250		

	RM (4-monthly basis)	RM (per Annum)
MARDI	*12,400.00*	*37,200.00*
UPM	*18,600.00*	*55,800.00*
IOI	*3,100.00*	*9,300.00*
Cyberjaya	*12,400.00*	*37,200.00*
Total	**46,500.00**	**139,500.00**

NB: No cost estimates are shown for West Country as they have not yet constructed any treatment plants.

APPENDIX 9.6

DETAIL INDICATIVE COST ESTIMATES FOR THE DATA CONVERSION TO SiCAD AND REFINEMENT PHASE OF THE LOW-LEVEL ICMS

Item	Station	Description	Duration	Unit	Amount (RM)	Remarks 1	Remarks 2	Pricing Sou	Data Sources
A	**Consultation Fee**								
A1	Mohamed Razali Mohamed	Consultation for developing ICMS	8 months	L/S	$ 14,080.00	10% loading	RM8,000 per month	MALSAT	
A2	Steve McCrone	Consultation for developing ICMS	8 months	L/S	$ 79,200.00	30% loading	RM15,000 per mont	MALSAT	
A3	Ghazaly Yeop Zainuddin	Project Manager	8 months	L/S	$ 22,000.00	50% loading	RM2,500 per month	MALSAT	
		Sub - total			**$ 115,280.00**				
B	**Data Conversion for Integrated Digital Maps**								
	Scope of work include :-								
	- Sourcing from Perbadanan Putrajaya, other								
	Stakeholders, and Government agencies								
	- Conversion fron SiCAD and AutoCAD into GIS format								
	- Conversion of coordinates								
	- Registration of coordinates								
	- Digitising								
	- Polygonisation								
	- Topology								
	- Database creation								
	- Data entry								
	- Draft Plotting								
	- Field Survey for detailed verification								
	- Field GPS Survey for accuracy verification								
	- Final Editing and Data Entry								
	- Final Plotting								
B1	***Topographical Maps***	- Contours (1 meter and 5 metres)	6 months	L/S	$ 39,600.00	2 GIS Technicians	@RM1,500 per mon	MALSAT	Perbadanan Putrajaya
		- Spot Heights			$ 26,400.00	1 GIS Specialist	@RM2,000 per month		
		- Rivers							
		- Lakes							
		- Digital Terrain Model							
		- Aerial Photographs	1 month	L/S	$ 3,300.00	1 GIS Technician	@RM1,500 per mon	MALSAT	Perbadanan Putrajaya
									Jurukur Perunding

APPENDIX 9.6

B2	***Infrastructural/Physical Maps***	- Buildings	4 months	L/S	$ 26,400.00	2 GIS Technicians	@RM1,500 per mon	MALSAT	Perbadanan Putrajaya
		- Roads and Highways							
		- Drainage							
		- LRT line & LRT station							
		- Emergency Services (police,fire brigade,hospitals)							
		- Telecomunication infrastructure							
		- Electricity Infrastructure							
		- Water Infrastructure							
		- Gas Infrastructure							
		- Public services (schools, postal)							
		- Other Landmarks							
B3	***Cadastral Maps***	- Lot Parcels	3 months	L/S	$ 19,800.00	2 GIS Technicians	@RM1,500 per mon	MALSAT	Perbadanan Putrajaya
B4	***Catchment Study Map Output***								
	Pollutant Sources Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Ecological Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Mini Wetland Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Water Quality Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Hydrological Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Erosion and Sedimentation		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Geological / Hydrogeological Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Drainage Masterplan Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Sewerage Masterplan Study		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Existing Landuse		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
	Landuse Master Plan		3 Weeks	L/S	$ 7,425.00	2 GIS Technicians, 1 Survey Techni	@RM1,500 per mon	MALSAT	Consultants
		Sub - total			**$ 197,175.00**				

APPENDIX 9.7
DETAILS OF INDICATIVE COST ESTIMATES OF THE INSTITUTIONAL STUDY

The Institutional Specialist's recommendations would necessitate an increase in staff costs as follows:

Majlis Daerah Sepang

1 Planner	*RM 26,000.00 per annum*
1 Environmental Officer	*RM 26,000.00 per annum*
1 Engineer	*RM 26,000.00 per annum*
1 Planning Assistant	*RM 21,000.00 per annum*
2 Technical Assistant	*RM 42,000.00 per annum*
Total	***RM141,000.00 per annum***

In addition to the above additional staff costs, an operational budget has to be allocated to support the "*Sub-Catchment Management Committee*" and the "*Stakeholders Consultative Committee*"

The costs are as follows :

(a)	*Travel & communication*	*RM 20,000.00 per annum*
(b)	*Purchases*	*RM 4,000.00 per annum*
(c)	*Refreshment*	*RM 2,000.00 per annum*
Total		***RM 26,000.00 per annum***
Total annual additional operating budget		**RM167,000.00 per annum**

GLOSSARY

GLOSSARY OF TERMS

A

Activated sludge process
A sewage treatment process in which the sludge in the secondary stage is put into aeration tank to facilitate aerobic decomposition by micro-organisms

Aeration
Exposing to the action of air or oxygen

Aerobic
Living in present of free oxygen (gaseous or dissolved).

Algae
Simple, photosynthetic plants with unicellular organs of reproduction.

Anaerobic
Living in absence of free oxygen (gaseous or dissolved).

Attribute
A trait, quality or property describing a geographical feature such as location co-ordinates, features, name and colour. It can also be depicted as a fact describing an entity in a relational data model, equivalent to the column in a relational table.

B

Base Map
A set of topographic data displayed in map form providing a frame of reference or contextual information to the user.

Biomass
The weight of all the organisms forming a given population or trophic level, or inhabiting a given region.

Biotype
Naturally occurring group of individuals having the same genetic composition.

Buffer
In spatial information systems, a buffer zone or simply buffer, is a polygon enclosing an area within a specified distance from a point, line or polygon. Accordingly, there are point buffers, line buffers and polygon buffers. Buffers are useful for proximity analysis, for example, find all stream segments within 300 feet of a proposed logging area.

C

CAD - Computer Aided Design
The design activities, including drafting and illustrating, in which information processing systems are used to carry out functions such as designing or improving a part or a product.

Carnivorous
Fish that feeds on mainly small insects and small fish.

Chlorination
Introduction of chlorine into effluent for disinfecting purposes.

Chlorophyll
Green pigment found in all algae and higher plants, responsible for light capture in photosynthetic. Several chlorophyll exits, with chlorophyll a being the only one common to all.

Clean Data
Data that is devoid of errors for GIS application. For example is a coverage that is without topological errors.

Coliform
Colon bacilli bacteria

Concept Plan
Illustration that show the proposed zone for development in general incoporate the land-use and circulation system.

Contour
A set of points representing the same value of a selected attribute and forming an imaginary line. The terms contour or contour line is most commonly used for lines connecting points on the ground having the same elevation.

Conversion of land
Land that have change the activity or restricted use for other use or development.

D

Database
A collection of data organized according to a conceptual structure describing the characteristics of the data and the relationships among their corresponding entities, supporting applications areas. For example, a GIS database includes data about the position and characteristics of geographical features.

Data Capture
The encoding of data. In the context of digital mapping this includes digitising, direct recording by electronic survey instruments, and the encoding of text and attributes.

Data Conversion
The translation of data from one format to another. Often, when data is moved from one system to another, some form of data conversion is required to convert the data to a format the receiving system can interpret. Sometimes it may be necessary to have an intermediate format. Many GIS supports conversion algorithms that enable them to accepts data in other formats.

Data Format
A specification that defines the order in which data is stored or a description of the way data is held in a file or record.

Denitrification
Reduction of nitrate to gaseous products such as nitrogen gas brought about by denitrifying bacteria

Dentritus
Organic debris from decomposing plants and animals.

Detrivorous
Fish that feeds on dead organisms and detrual materials.

Digitising
A method of data capture that involves the conversion of data in analogue form, such as maps and aerial photographs, into a digital form that is directly readable by a computer. This is normally achieved manually by a human operator using a digitizer, although methods of automated digitising and semi-automated digitising also exist. The result of digitising is a digital map in vector form.

DXF - Digital Exchange Format
A format for transferring drawings between Computer Aided Design systems widely used as a de facto standard in the engineering and construction industries.

E

Ecology
Study of the relations of animals and plants, particularly of animal and plant communities, to their surroundings.

Ecosystem
A community of organisms, interacting with one another, plus the environment in which they live and with which they also interact.

Effluent
Treated sewage discharge

Expert System
A computer system that provides for solving problems in a particular application area by drawing inferences from a knowledge base acquired by human expertise, it is a form of artificial intelligence. Knowledge based systems, or more commonly, expert systems have been used for purposes of automated map generalisation. This is an area that they have particular application within the field of Geographic Information Systems.

F

File Structure
The organisation imposed on a file to facilitate processing.

Fixed film growth processes
Active microorganisms are developed by passing organic sewage over a solid covered in a biomass (slime).

G

GIS - Geographical Information System - Geographic Information System
A computer system for capturing, storing, checking, integrating, manipulating, analysing and displaying data related to positions on the Earth's surface. Typically, a Geographical Information System (or Spatial Information System) is used for handling maps of one kind or another. These might be represented as several different layers where each layer holds data about a particular kind of feature. Each feature is linked to a position on the graphical image of a map.

Layers of data are organised to be studied and to perform statistical analysis. Uses are primarily government related, town planning, local authority and public utility management, environmental, resource management, engineering, business, marketing, and distribution.

H

Habitat
Place with particular kind of environment inhabited by organism(s)

Hard Copy
A print or plot of output data on paper or some other tangible medium.

Herbivorous
Fish that feed predominantly on plant leaves and small grasses.

I

Integrated Planning
The planning that integrate all aspect of politic, social, economy, physical and involved various related agency.

L

Layer
A usable subdivision of a dataset, generally containing objects of certain classes, for example rivers, roads or geology.

Littoral Zone
Refers to the edge of the closed water body particularly pond, lake and reservoir.

M

Map
A graphic representation of features of the earth's surface or other geographically distributed phenomena. Examples are topographic maps, road maps, and weather maps.

Master plan
Overall strategic planning for the area, that shows the land-use zoning and main acessibility, and normally its in the form of written report with illustration and diagram.

Microbial Carrying Capacity
Refers to limit beyond which decomposition of organic materials by microbes is generally not possible.

N

Network
An interconnected set of arcs or lines representing possible paths for the movement of resources from one location to another. A group of computers that are linked, and are able to share peripherals, software and data. The Internet is probably the most well known example of a computer network. A type of database structure. A network data model is based upon the idea of explicit links between related entities. The most well known example of the network model is the CODASYL data model.

Nitrification
Conversion by bacteria of organic compounds of nitrogen, unavailable to green plants, into available nitrates.

O

Oligotrophic
(Of lakes) poorly productive in terms of organic matter formed, nutrient supply low.

Omnivorous
Fish that feeds on wide variety of organisms from plant to animals.

One-off capital expenditure
These are expenditure that will occur once, especially on the setting up of a facility or system initially, and which expenditure may be incurred again after several years at the end of its depreciated life. Common examples of such capital items are plant and machinery, computer hardware and software, software development costs, laboratory equipment, etc.

One-off establishment costs
These are expenditure that again may occur only once, as opposed to being of a recurring type that would be expended in every financial period. Examples would be professional legal fees for the drafting of new laws, professional consultants' fees for specific one-off studies, the setting up a laboratory building, etc.

P

Photosynthetic
In green plants, synthetic of organic compounds from water and carbon dioxide using energy absorbed by chlorophyll from sunlight.

Polygon
A feature used to represent areas. A polygon is defined by the lines that make up its boundary and a point inside its boundary for identification. Polygons have attributes that describe the geographic feature they represent.

Population Equivalent (PE)
Unit as person or capital for sewage loading estimation. One PE contributes 225l per day of raw sewage

Q

Query
A statement expressing a set of conditions that form the basis for the retrieval of information from a database. Queries are often written in a standardized language such as SQL.

R

Recurring direct costs of operations
These are costs that would need to be incurred every financial period to enable an activity to be maintained or sustained. Examples would be the staff's salaries, the utilities (electricity, water, etc,), repairs and renewal expenditure that would need to be incurred after the setting up of a laboratory. (Such a lab may be set up to implement a monitoring programme, for instance).

Rhizome
Underground stem, bearing buds in axils of reduced scale-like leaves, serving as means of perennation and vegetative propagation.

Riparian Park
Refers to vegetable area of the edge of stream, river or tributary.

S

Sequencing batch reactor
A fill-and-draw activated-sludge treatment system having five steps in sequence: fill, react (aeration) settle (sedimentation/clarification), draw (decant)

Sewage Treatment
Processes for purification of wastewater or sewage flow

Sewer
An underground pipe for carrying sewage

Sludge
Semiliquid residual waste from the treatment of sewage

Spatial Data
Any information about the location and shape of, and relationships among, geographic features. This includes remotely sensed data as well as map data.

Standing Crop
The production of plant material water existing condition.

Structure Plan
Written document with illustration and diagram. The document explained the policies and general proposal for local authority in term of preservation, development, land-uses etc. in their area.

Suspended growth processes
Micro-organisms remain in suspension in the sewage and are aerated over a period to remove the organics

U

Use Class Order
Regulations under written laws that allowed type or activities in the use class to develop for other purpose in the same classes without any development order.

User Requirements Analysis
A study of the needs of a user of a system conducted prior to system development.

V

Vector Data Model
An abstraction of the real world where positional data is represented in the form of co-ordinates. In vector data, the basic units of spatial information are points, lines and polygons. Each of these units is composed simply as a series of one or more co-ordinate points, for example, a line is a collection of related points, and a polygon is a collection of related lines.

W

Wastewater or Sewage
Fluid discharge from domestic sanitary appliances.

Z

Zoning Plan
Distribution plan that show the land-uses and density for the purpose of planning and development control.