

Application of IWRM/IRBM Principles for Tasik Putrajaya Catchment

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Abstract

Integrated Water Resource Management (IWRM) principles, where the need of holistic and systematic management approach is required, has been accepted by the Malaysian Government and these needs are already in the government policy statements such as in the RM8, RM9, OPP3 and the National Water Vision.

The Federal Government has encouraged all state governments to establish its own water management system i.e. in complying with the standard IWRM policies. The state of Kedah and Sabah has recently gazette their own water management act. The Selangor State Government has already established the Lembaga Urus Air Selangor (River Basin Management Authority) Enactment way back in 1999 to improve their river basins management.

One of the river basins in Selangor which need a serious and systematic approach of management is the Putrajaya Lake Catchment. The planning, approval, monitoring and enforcement jurisdiction over all land development and human activities in this catchment area will have a direct impact to the Putrajaya Lake. The Lake is an urban lake, created right in the middle of the newly developed Putrajaya, the Government Administrative City of Malaysia.

Putrajaya was planned to be developed into a “City in a Garden” with the 600 hectares Putrajaya Lake and Wetland as its focal point. The lake has to be always in acceptable urban setting condition with a high water quality level to cater its multi-functional uses such as for boating, fishing, recreational and water sport.

This paper discusses the Putrajaya Lake Catchment system and the various mechanisms that had been implemented for an effective and best result to ensure the high water quality level of the lake is continuously maintained. It also describes some problems in implementing an effective catchment management.

Keywords: Catchment management, Putrajaya lake and wetlands, management issues, implementation, enforcement, monitoring and funding.

Introduction

The Malaysian Government in its policy statements and other planning documents has included the Integrated Water Resource Management (IWRM) approach as part of its development programs. This holistic water management approach is already in the government policy statements such as in the RM8, RM9, OPP3 and the National Water Vision.

All the State Governments had been encouraged to establish their own water management system that complies with the standard IWRM policies. The states of Kedah and Sabah have gazetted their own water management act for this purpose. The Selangor State Government had gazetted the Lembaga Urus Air Selangor (River Basin Management Authority) Enactment in 1999 to improve its river basins management.

The Putrajaya Lake Catchment and LUAS

One of the river basins in Selangor which need a serious and systematic management approach and control is the Putrajaya Lake Catchment.



Figure 1. The Putrajaya Lake Catchment is only a small part of the bigger Sungai Langat River Basin.

The Putrajaya Lake Catchment is a small river catchment of about 52.4km² (square kilometers), located in the middle of Sungai Langat River Basin, 25 km south of Kuala Lumpur. It extends about 12 kilometers in the north to south direction and about 4.5 km in the east to west direction.

Figure 1 shows the location of this small catchment within the large Sungai Langat River Basin. In this small catchment area lies the Putrajaya City – the newly developed Government Administrative Center of Malaysia. The 600 hectares Putrajaya Lake is the focal point of this “City in a Garden”. The lake is use for activities such as recreational, boating, fishing and water sport, in addition to enhancing the aesthetics of its waterfront characters.

Even though it is an urban lake in the middle of a city, the Putrajaya Lake has always to be in its acceptable good water quality conditions to cater for its multi-functional uses.

As an urban lake with active human activities around it, the planning, approval, monitoring and enforcement jurisdiction over all land development and human activities in its catchment will have a real and direct (normally negative) impact to the water quality and the lake characteristics.

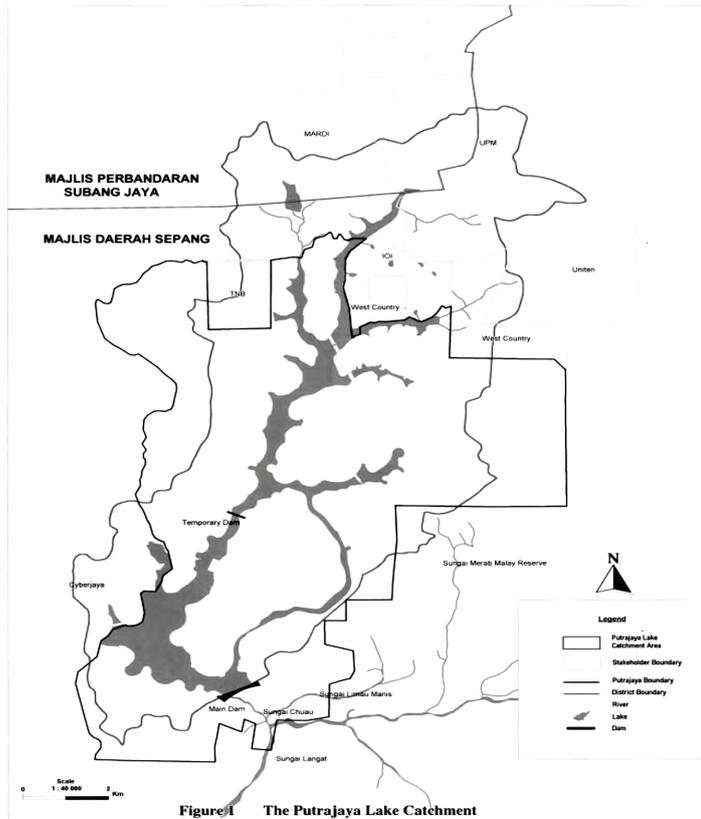


Figure 1 The Putrajaya Lake Catchment

Figure 2. 30% of The Putrajaya Lake Catchment areas located in Selangor.

Development projects within Putrajaya boundary, which occupies about 60% of the Lake catchment area are complying to the Putrajaya Masterplan and stringent regulatory enforced by the Perbadanan Putrajaya (PPj).

However, the remaining 30% of the same catchment area but located in the upstream part outside the Putrajaya boundaries (in the state of Selangor as in Figure 2) belongs to various landowners and without coordinated control over its development and activities programs. This has become a serious concern to the Selangor State Government as well as to the Perbadanan Putrajaya.

The Putrajaya Lake integrated catchment management

Why is it important to manage the catchment?

Being a man-made lake in an urban setting, the Government recognizes that careful planning and management of the physical as well as the human issues within the catchment is necessary.

The task is to achieve and maintain The Putrajaya Lake Ambient Water Quality Standards (PLWQS) (which is of higher level than the DOE's Interim Water Quality Standards of Class IIB) and other objectives set for Putrajaya Lake and the allowable activities in it.

One of the major issues is the control of development activities in the catchment. There is a need to develop a pragmatic and implementable plan of action to ensure that the catchment area of Putrajaya Lake and the water resources within the catchment area are protected from pollution and the water quantity is maintained.

Furthermore, the design objectives of the artificial wetlands were only to improve the water quality of the surface runoffs flowing into the lake from the upstream areas. It was designed to treat only certain level of pollution loading i.e. the level of pollutant in the runoff should be limited to a certain acceptable level to enable the wetlands to function properly.

In the year 2000, Perbadanan Putrajaya has developed the Catchment Development and Management Plan (CDMP 2000) for Putrajaya Lake Catchment. This document is for easy reference to all stakeholders and it provides guidelines on the various methods/control to achieve and maintain the water quality level required for the Putrajaya Lake. The guidelines also define the land-use, drainage and sewerage master plans for the areas within the small but very important catchment.

Lembaga Urus Air Selangor (LUAS)

The CDMP 2000 has clearly defined the role of LUAS in implementing its power to manage, control and enforce the necessary rules to the landowners and stakeholders within the 30% of the Putrajaya Lake Catchment area in Selangor.

During the last eight (8) years of applying the CMDP 2000 guidelines, however, shows that the planning control for land use, drainage, environmental pollution control and coordination tasks empowered to LUAS is not easily applicable and implemented by the agency.

At the same time, realizing its role to ensure the success implementation of the IWRM and IRBM in the state, a strategic empowerment review of this organization is necessary to arrest various setbacks experience so far.

Thus, the challenges face by LUAS can be defined which includes the following:

- The problems are known;
- The causes are often complex and the problems cannot be solved overnight;
- The main task will include the decision on how to implement a successful coordination and programs agreeable by all stakeholders; and
- The Putrajaya Lake Catchment is the testing ground of its capabilities to apply the IWRM principles to all other areas in Selangor.

Catchment Management Plan Policy Statement

Recognizing the importance of careful planning and management control for the attainment of the city vision, Putrajaya Lake Catchment Management Plan need to be based upon the following policies:

- i. Pollution control measure shall focus on the minimizations of pollutant generation at source;
- ii. The drainage system shall base on vegetated landscape drainage corridors and conversion of flood detention and water quality enhancement ponds into mini-wetlands;
- iii. The Putrajaya Wetland will be considered as an *additional (last stage)* water quality enhancement or “polishing” mechanism. It will integrate with the upstream water quality enhancement features, such as vegetated landscape riparian buffers, drainage corridors and upstream mini-wetlands cum flood detention ponds.
- iv. Diversion or alteration of the natural drainage lines in the catchment shall not be allowed, however, improvement of its flow profile will be considered;
- v. All development activities in the catchment shall be in accordance with an agreeable and approved Catchment Development Land-use Master Plan.
- vi. All pertinent regulatory agencies shall coordinate (LUAS will play major role) their functions and enforcement effort to attain the catchment management objectives and targets;
- vii. Active participation of the catchment stakeholders and communities in the management of Putrajaya Lake;
- viii. Equitable sharing of the cost for the implementation of the catchment management programs including the maintenance cost shall be recovered based on the policy of “*the polluter pay*” and “*the direct beneficiaries pay*”.
- ix. Realization of that, the cooperation and mutual agreement among all stakeholders in achieving the common goal of best water quality level of the surface runoff flowing through a catchment will be the best Integrated Water Resource Management outcome.

The successful implementation of ICDMP

There is a need to update the CDMP 2000 to incorporate eight (8) years of implementation experience and taking into consideration the latest policy, legal, current and future landuse plans of the catchment stakeholders. This will include the identification of the relevant clauses in the LUAS Enactment and develop the required institutional framework to enable LUAS to work with Perbadanan Putrajaya to protect Putrajaya Lake Catchment.

The Review Strategy

- i. Development of institutional structure and identification of necessary legal provisions in LUAS Enactment to enable management of the 30% of the Putrajaya Lake Catchment, which is in Selangor, to be upgraded to the same level as that implemented by Perbadanan Putrajaya;
- ii. Proposed institutional structure for managing the Putrajaya Lake Catchment, utilizing the provision in the LUAS Enactment (e.g. Clause 56 that is to enable the Putrajaya Lake Catchment to be a “Declared Catchment” with a management body involving all pertinent stakeholders);

- iii. Legal guidelines to support LUAS and Perbadanan Putrajaya in implementing a transboundary catchment institutional framework, utilizing the existing provisions in the LUAS Enactment, and other related laws;
- iv. Updating of CDMP 2000, so that an integrated lake catchment management and monitoring system can be implemented by the developed institutional structure especially by LUAS and its legal provisions; and
- v. Info-sharing among catchment's stakeholders to support Integrated Catchment Management System (ICMS)
- vi. Effective telemetry system to enable real-time, remote measurement and reporting of lake catchment monitoring information centre.

Aspects of Management and Planning

The CDMP 2000 review will cover the details for the integrated regulatory control for the areas outside Putrajaya especially on the following aspects:

- a) Planning and Land-use Control;
- b) Drainage Planning and Water Quantity Management;
- c) Sewerage Planning;
- d) Environmental Management and Water Quality;
- e) The Lake and Wetlands;
- f) The information System study; and
- g) Legal and Coordination Between Regulatory Agencies

The management scopes and its recommendations for review on various aspects are as in Appendix A.

Organisation and coordination structure

Administrative Jurisdiction

The catchment lies within the administrative jurisdiction of the Majlis Daerah Sepang (MDS), Majlis Perbandaran Subang Jaya (MPSJ) and PPj. **Figure 3** shows the Northern area of Putrajaya Catchment boundaries. The stakeholders in the Putrajaya Lake Catchment are:

- i. Universiti Putra Malaysia (UPM);
- ii. Malaysian Agricultural Research Development Institute (MARDI);
- iii. Industrial Oxygen Incorporated Bhd. (IOI);
- iv. West Country Sdn. Bhd. (WEST);
- v. Universiti Tenaga Nasional (UNITEN);
- vi. Sungai Merab Malay Reserve (SMMR);
- vii. Cyberjaya Flagship Zone - Phase 2B (CFZ), and
- viii. Putrajaya.

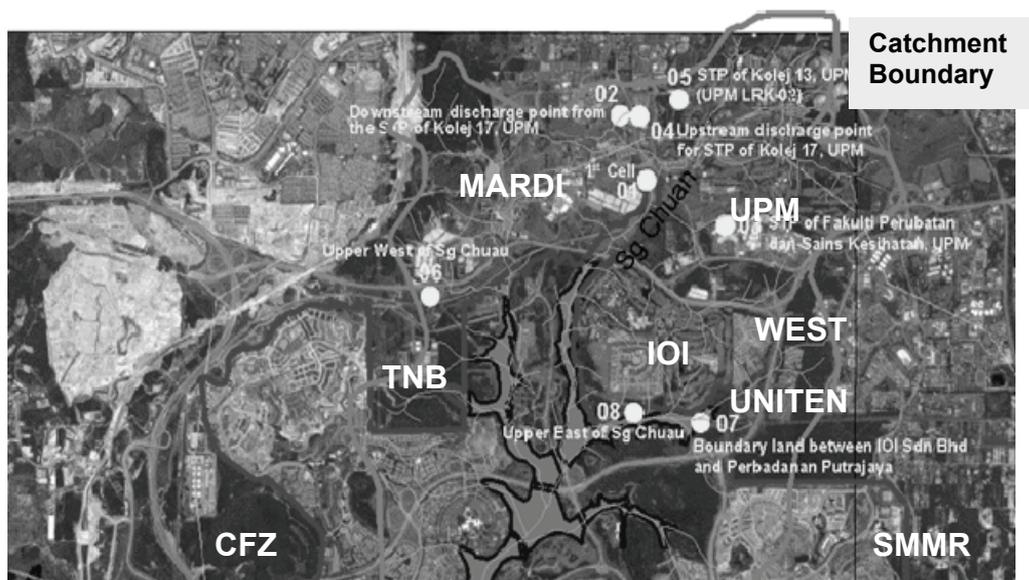


Figure 3. Upper Part of Putrajaya Lake Catchment (30% of the Lake's Catchment is not under the jurisdiction of Perbadanan Putrajaya)

Implementation requirements

- i. Successful implementation requires co-ordination, co-operation and collaboration between existing planning authorities and between different interest groups and stakeholders.
- ii. CDMP is more than a technical and engineering solution to catchment management, providing a platform for integration of various stakeholders' interest, besides establishing an overall guidance for consistent implementation of policies.
- iii. Legislative and institutional framework has to be put in place first to establish the discipline and direction.
- iv. It is necessary to establish a mechanism that can merge co-ordination and seek co-operation not only across sectors, but also political and administrative borders.

The Catchment Development and Management Committee

In keeping up with the catchment development on-going progresses, cooperation and coordination amongst the stakeholders together with the implementation of various regulations and control of land development and human activities, A Federal and State inter-government committee consisting of officers from different government agencies, local authorities and stakeholders will need to be established.

Known as the Putrajaya Lake Catchment Management Committee (PLCMC) as recommended by the CDMP 2000, the formation of this committee will be in accordance to the Selangor Waters Management Authority Enactment (SWMAE, 1999).

The earlier recommended committee chaired by the State Secretary of Selangor (as listed in Appendix B) with Lembaga Urus Air Selangor (LUAS) and Bahagian Tasik Perbadanan Putrajaya as the joint-secretariat, however, has no legal powers. Thus, to facilitate the monitoring and implementation of legislative enforcement of the catchment area, a legally constituted Management Committee is to be formed under the SWMAE (1999).

To expedite the legal process in implementing, monitoring and enforcement of the SWMAE (1999) Act, Perbadanan Putrajaya and the Selangor State Government through LUAS is preparing the formulation of the “Study on Operationalisation of LUAS’s 1999 Enactment for Institutional Development and Integrated Catchment Management for Putrajaya, 2008”

Conclusion

The success of the implementation of an Integrated Catchment Management especially for an urban catchment depends largely on the cooperation and coordination between the stakeholders (landowners), government agencies and the local authorities involved.

Although through the cooperation of LUAS, MPSJ, MDS and Perbadanan Putrajaya, the existing by-laws and guidelines can be executed within the CMDP, the real challenge is whether the authorities can work together with all the landowners and stakeholders for a command goals of achieving a predetermined water quality of a lake.

The success, however, will be seen more effectively whereby the by-laws and guidelines is carried out by all the stakeholders of the lake catchment voluntarily for the benefit of everybody within the catchment.

The practical application of this arrangement will also be a showcase of our legislative frameworks and the much-awaited effective solutions for the use of all the other water basins management for the whole of Malaysia.

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Appendix A: Catchment Management Scope Review and Recommendations

SCOPE	DESCRIPTION	RECOMMENDATION
Water Quality Management	The current water quality in the lake is within the permissible values of Putrajaya Lake Water Quality. It is recognized that the most effective way to attain the desired water quality objective is to minimize the generation of pollutants at their source. Also, it is recognized that erosion and transport of sediment during the land clearing, earthworks and construction phase pose a very serious threat to lake water quality.	To manage pollutants at source. The drainage system should be based on vegetated landscape riparian buffers, drainage corridors and mini-wetlands water quality enhancement ponds. To prevent the entry of rubbish Gross pollutant/sediment trap (GPT) structures are to be installed at the ends of all concrete drains flowing into the vegetated landscape drainage corridors. To ensure effective control of erosion and sediment during earthworks. It is recommended that a new "Erosion And Sediment Control By Law" be enacted by Putrajaya Corporation and Majlis Daerah Sepang. The recommended By- Law should be supported by a new "Standards For Erosion And Sediment Control" Manual.
Water Quantity Management	It is important that all possible runoff arising from lake catchment should enter into the Lake system. Also, there should be proper control over the amount of water drawn for irrigation or other purposes and no diversion or alteration of the natural drainage lines in the catchment is to be allowed.	Compensation flow equal to 10% of the Annual Average Flow may be allowed during the in-filling of the main dam. A well field of 6 groundwater wells can be developed, downstream of the main dam, to supply 0.013 m ³ /s (10,000 g/hr) of groundwater to meet any water demand. A separate irrigation masterplan study on the impact of the proposed rainwater harvesting within the catchment on the water quantity in the lake
Drainage Planning	The drainage Masterplan comprises of Drainage Planning and Design Guidelines.	Drainage planning and Design Guidelines based on the vegetated drainage corridor concepts. Specific recommendations for upgrading the drainage systems in UPM, MARDI, IOI, West Country and Cyberjaya
Pollutant Sources Management	The sewage effluent discharge from outside have been identified as the major point source pollutant. They are controlled in the sewerage masterplan. Accident associated with the oil tankers moving along the road passing through the wetlands can be a major point source pollutant. Thus, the pertinent authorities (JKR, Putrajaya Corporation) has to ensure that Emergency. Response Plans and Procedure are prepared and implemented to handle such potential emergencies. THE ISSUES In-stream discharges from UPM and MARDI located north of Putrajaya Lake Catchment Area (sewerage discharges, treatment plant, septic tank system) Discharges from point and non-point sources of various types of pollutants from agriculture, institutions, commercial areas, golf course, residential areas, power station, health facility and parks The wetland cells (point and non-point pollutant source) Existing and future landuse type and pollution potentials The main lakes and outlets	Non-point pollutant sources from road runoffs are to be controlled through the implementation of the drainage system based on vegetated drainage corridor. Those from fertiliser and pesticide input from MARDI, UPM, IOI, and Cyberjaya are to be controlled by regulatory measures using the prepared MP guidelines on the use of fertilizer and pesticides. To improve the quality of water entering into Putrajaya Lake To ensure Putrajaya Lake and water resource areas are protected from pollution To streamline and improve on the efficiency of monitoring, observation and enforcement of water quality in the Putrajaya Lake Basin To enhance the overall environment

SCOPE	DESCRIPTION	RECOMMENDATION
Land-use Planning	<p>To ensure that the development in the above areas are in line with the objectives for the catchment a land-use masterplan has been prepared.</p> <p>Detailed review of any changes or deviations between current landuse and landuse in the CDMPPL, 2000</p> <p>An evaluation of the committed projects that have come into effect since the publication of the CDMPPL (Perbadanan Putrajaya, 2000)</p> <p>Updated GIS generated maps showing the current landuse scenario</p>	<p>Landuse Issues</p> <p>Sustainability of the landuse landuse positions of major stakeholders (shares of the Putrajaya Lake catchment) identify and evaluate sensitive issues of physical development</p> <p>Landuse Policies and Guidelines</p> <p>Structure and Local Plans used:- Selangor Structure Plan; Putrajaya Structure Plan Sepang Local Plan; and Subang Jaya Local Plan.</p> <p>Putrajaya Landuse Masterplan</p> <p>Putrajaya Urban Design Guidelines (UDG)</p> <p>Multimedia Super Corridor (MSC) - The plan should be incorporated in MSC areas Local Plan that is currently being prepared by JPBD.</p>
Planning and Land-use Control	<p>Planning and land use control of areas within the catchment represents one of the most important mechanisms for the protection of the water quality in the lake. The mechanism and set-up for control and management of planning in Majlis Daerah Sepang (MDS) and Majlis Perbandaran Subang Jaya(MPSJ) is not as well organized as in Piutrajaya.</p> <p>The major land parcels in the catchment areas outside Putrajaya are UPM, MARDI, IOI, TNB, West Country, UNITEN, Cyberjaya and the Sg. Merab Malay Reserve.</p>	<p>To develop and gazette local plans for the land parcels outside Putrajaya. This will be carried out by JPBD as part of local plan for MSC Area.</p> <p>To implement similar planning submission and approval process requirement similar planning submission and approval process requirement as those in Putrajaya Corporation, for all proposed development projects in the catchment areas of Majlis Daerah Sepang (MDS).</p>
Sewerage Planning	<p>The sewerage masterplan comprises of Sewerage Planning and Design Guidelines:</p>	<p>Specific recommendations for the management of the sewage effluent discharge from MARDI, UPM, IOI and Cyberjaya.</p>
Drainage Management and Control	<p>There is no integrated approach to this issue since the responsibilities for drainage lies with JPS, local authorities and other agencies such as JKR and other developers.</p>	<p>To require all development projects, including utilities and transportation projects to comply with the recommended drainage concept and design guidelines for the Putrajaya Lake catchment.</p> <p>To assign an additional Civil Engineer and Technical Assistant to MDS so that they can give special attention to drainage and earthworks for developments in the Putrajaya Lake catchment areas.</p>

Appendix B: The Putrajaya Lake Catchment Management Committee (PLCMC) as recommended by the CDMP 2000

The designations of the committee are as follows:

Chairman: Selangor State Secretary

Secretariat: LUAS/The Lake Unit, Perbadanan Putrajaya;

Members:

- i. Selangor Waters Management Authority (LUAS),
- ii. Jabatan Pengairan dan Saliran (JPS),
- iii. Jabatan Alam Sekitar (JAS),
- iv. Jabatan Perancangan Bandar dan Desa (JPBD),
- v. Jabatan Kerja Raya (JKR),
- vi. Jabatan Perkhidmatan Pembentungan (JPP),
- vii. Majlis Perbandaran Subang Jaya (MPSJ),
- viii. Majlis Daerah Sepang (MDS),
- ix. Perbadanan Putrajaya (PPj),
- x. Representative of Stakeholder's Consultative Committee