

Integrated Water Resources Management Improving Langat Basin Ecosystem Health

Mazlin B Mokhtar, Mohammad Fawzi Al Ajlouni and Rahma Elfitrie
Center of Environmental Sciences and Natural Resources,
Studies Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia 43600 Bangi, Selangor, Malaysia

Abstract: The ecosystem provides us with all the goods and services that form the base of our economic, social cultural and spiritual life. Good scientific information will be required for managing the environment by using the Ecosystem approach. The groundwater is considered as a possible supplementary of alternative water source, and some factories already started shifting their water source from surface water to groundwater. Uncontrolled use of groundwater, however, may induce serious environmental problems, e.g., land subsidence, saltwater intrusion to the aquifer. The establishment of a balanced multi-sector and integrated groundwater resources and environmental management plan is deemed urgent to attain a sustainable groundwater resources use and to maintain a favorable groundwater quality in the Langat Basin. To achieve sustainable lifestyle in large scale ecosystem requires integrated and holistic approaches from all stakeholders. Through Aquifer Storage Recovery (ASR) it was determined a revolutionized water resources management, providing a sustainable supply while minimizing the environmental impact of surface storage. By using underground geologic formations to store water, by integrated water resources management advisory system (IWRMAS) aquifer recharge can now easily applied to obviate water resource and environmental problems, including seasonal shortages, emergency storage, ground subsidence and saline intrusion.

Keywords: Integrated water resources management, aquifer storage and recovery, ASR advisory system

INTRODUCTION

Population growth and urbanization, industrialization and irrigation for agriculture are imposing rapidly increasing demands on the water resources even as pollution reduces the sources for potable water. Thus, any new clean water source will be an asset to have^[1]. There is an increasing trend in water usage in the Langat Basin due to the increase in agricultural activities, domestics and industries. This result in an increasing need for groundwater resources which, in turn, causes the decrease in groundwater reserve. Furthermore, this area becomes more important as it is the fastest growing economic area in Malaysia. The practicable limit of surface water resources development has been reached in regions of high demand, and it has become necessary to implement inter-basin and inter-state water transfers. The urban population in Malaysia exceeds 60% and about 20%

reside in the Sungai Klang Basin. This has necessitated inter-basin transfers for domestic and industrial water supply from Sungai Langat and Sungai Selangor Basins to Sungai Klang Basin. The government is also planning to implement an inter-state raw water transfer from Pahang to Selangor, which will transfer 2.260 million liters of water per day. Since 98% of the total national water use originates from surface water resources, the water supply services are easily affected by long dry spells. Groundwater resources need to be explored and sustainably developed especially in water stressed and isolated areas. A study to establish a sustainable groundwater resource and management plan for Sungai Langat Basin was completed in 2002. The current approaches towards water supply management are supply driven-when there is a shortage, new sources are developed. This business as usual approach is no longer sustainable because of the ever-increasing water demand. Groundwater resources of Langat Basin are

Corresponding Author: Mazlin Mokhtar, Center of Environmental Sciences and Natural Resources Studies, Institute for Environment and Development (LESTARI), Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia

being considered for use as an alternative and complimentary source of water for the future^[5] Water demand management that seeks to maximize the usage of water also conserves water and thus limits the need for new supplies. In 1999, the Government produced Guidelines for Installing a Rainwater Collection and Utilization System that documents some of the ways in which rainwater can be collected from roofs of buildings and the practical utilization of rainwater. More than 50% of the domestic water use does not need treated water quality. In 2002, the Government imposed a condition for the installation of 6-liter toilet flushing systems in new buildings. Zaharaton^[8] said that the four major water-related problems are water shortages, water pollution, floods and landslides. These problems disrupt economic activities and the last two can result in loss of properties and lives. Al ajlouni^[4] says that one technique that is being tested is the use of the Aquifer Storage Recovery ASR technology. ASR wells are used for the cyclic storage and recovery of water. Throughout the year, there are rainy seasons and dry seasons. Surface water is exposed for pollution and many pollutants effects, so ASR is an application to pollution prevention in everywhere, ASR is very important to consider as anew management Tools.

Problem statement: Some of the related water problems in Malaysia are:

- Water flooding problems: water should be stored during flooding
- Water shortages, and high water demand in certain regions, Water for Drinking, Water for irrigation, Water for industries
- Increase in demand drinking water due to increasing population ratio

Objectives: The aims of the project were,

- To create a sustainable groundwater resources and environmental management framework for the Langat Basin
- To establish a monitoring system and Geographic Information System (GIS) to support the Management framework
- To Advanced an Integrated Water Resources Management advisory System (IWRMAS) for the implementation of the Management framework to the Langat Basin, and to be able to utilize the Management frameworks for other basins

Related works: Integrated Water Resources Management (IWRM) is an approach towards

integrating and effectively coordinating policies, programs and practices addressing water-related issues, which takes into consideration the various aspects of socio-economic development and the conservation of the environment^[9]. Water resources development has been a catalyst for socioeconomic development of Malaysia^[8]. The need for managing water resources is very important as the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people and the environment suffer badly. The management of water resources should be based on sound policies and strengthened institutional arrangements^[8]. Aquifer recharge and change in subsurface storage include the result of the natural groundwater recharge-discharge regime and artificially managed processes. Thus subsurface storage is induced by any recharge, either natural or artificial^[7].

MATERIALS AND METHODS

- Integration of water with social and economic development
- IWRM formulates and implements a course of action involving the management of water and related resources to achieve optimum allocation of water resources within a catchment or river basin, while protecting and restoring the environment
- integration of natural and human systems that include integration of different components of water and
- integration of water with related land and environmental resources
- Managing the river basins according to their natural physical boundaries rather than administrative and political boundaries
- Using The Integrated Water Resources Management (IWRM) As a real Strategy which is formulate a framework of agreement on major water resources issues, developed by the primary water management agencies
- Using the Integrated Water Resources Management Advisory System (IWRMAS) to improving the groundwater Quality and quantity By Aquifer Storage and Recovery (ASR) concept and improving the wetland water quality

RESULTS AND DISCUSSION

- Construct a framework of agreement among the primary water management agencies of the

Tualatin Basin about the critical water resource issues that need to be addressed

- Improve the overall understanding environmental health issues of the Langat Basin, and spreading the health of streams, reservoirs, rivers, and the terrestrial environment
- Waterborne diseases will be decline slightly due to improving the water quality by improving the wetlands, rivers, and that's will reflex on the human health in the Langat Basin
- Pioneered the ecosystem approach as part of the Endeavour of LESTARI to develop a holistic framework for environmental concern

CONCLUSION

- Groundwater in the Langat basin is a much needed resources for the sustainable development of the Basin
- The potential source of contamination should be monitoring from the industrial and domestic activities, excessive application of pesticides and fertilizers for agriculture, mining activities and leachet from landfills
- Planning of water resources is very urgent and necessary to mitigate potential future shortages at the national and regional level
- Reuse large amount of water during a short period of time and to store huge quantity of stormwater in the aquifer recharging and re-produce it as non conventional water sources. Estimation of the Recharge quantity to the targeted aquifers can also be made
- Improve the quality of the natural resources such as Groundwater by:
 - Less water withdrawn due to recharging additional quantity of water to the aquifers by artificial recharging
 - Improving the aquifer water quality by recharging the treated water to the aquifers that increase dilution to the aquifers groundwater
- Provide the decision makers the best system to solve complex issues through the advisory system with suitable future vision by utilizing the ASR concept in the integrated water resources management

REFERENCES

1. Malaysia's water vision, 2001. Global water partnership (GWP). Integrated Water Resources In Malaysia the Way Forward.
2. Mazlin, B.M., F.M. Ahmad and I. Shaharudin, 2000. Proceedings of the 2001, Langat Basin Ecosystem Research Symposium. What We Want, LESTARI, UKM Bangi, pp: 3-7.
3. Mohd Nordin Hj Hasan, 2000. Proceedings of the 1999,5-6 june, Langat Basin Research Symposium. Ekosystem's Research Langat's Basin Holistic Approach with Base Ecosystem Health Concept Penerbit LESTARI, UKM ISBN983-9444-17-4 pp: 11-17.
4. Al Ajlouni, M.F., A.R. Rakmi, R. Abdul Ghani, M. Mazlin and E. Noor, 2007. Aquifer storage in UKM Bangi campus as sub langat River Basin water resources management. Int. J. Soft Comput. Appl. London, 1: 55-61.
5. Al Ajlouni, M.F., R.A. Rahman, A.G. Rafek and .N. Ezlin, 2007. Advisory system software for aquifer storage and recovery in langat basin ukm campus as case study (IWRMAS). Int. J. Soft Comput. Appl. London 1: 51-55.
6. Raja Dato' Zahraton., 2004.30/3-2/4 Water Resources Management In Malaysia the Way Forward , Asia Water Conference:70-78
7. Tuinhof, A. 2003. Recharge enhancement and sub surface storage: A promising option to cope with increasing storage needs. Man agement of Aquifer Recharge, Utrecht, The Netherlands: NCC-IAH publication.
8. Reese, R.S., 2002. Inventory and review of aquifer storage and recovery in Southern Florida, U.S. Geological Survey Water-Resources Investigations Report 02-4036.US. Geological Survey, Tallahassee, Florida.
9. Shahrizaila Abdullah (1999) Towards A Malaysian And Global Vision For Water, Life And Environment. In Sustainable Management of Water Resources in Malaysia – A Review of Practical Options. Global Environment Centre, Petaling Jaya, 17-24.
10. Water Resources Management in Malaysia. 2004. The Way Forward. Achieving World Class Water, KDN PP117 20/9/2003 ISSN 0128-4347. vol: 22.