Logical Framework for Managing Sarawak River Basin through Integrated Hydrosystem Approach

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The Sarawak River Basin is one out of the 21 river basins in the state of Sarawak; and this is where the state capital, Kuching, is located (Figure 1). Managing the Sarawak River Basin is a challenging task due to conflicting needs such as water supply, waste dumping, navigation and flood mitigation besides balancing the development of the basin in terms of water resources, urbanisation and wetland protection.

Various agencies are involved in the management and development of the river basin and, in some situations, these agencies undertake conflicting roles (Table 1). This article aims to introduce a conceptual approach using logical framework to support the integrated management of the Sarawak River Basin. Logical framework has been applied in many cases of integrated water resources management and could be used as a tool to communicate among the various agencies and stakeholders in the management and sustainable development of the river basin.

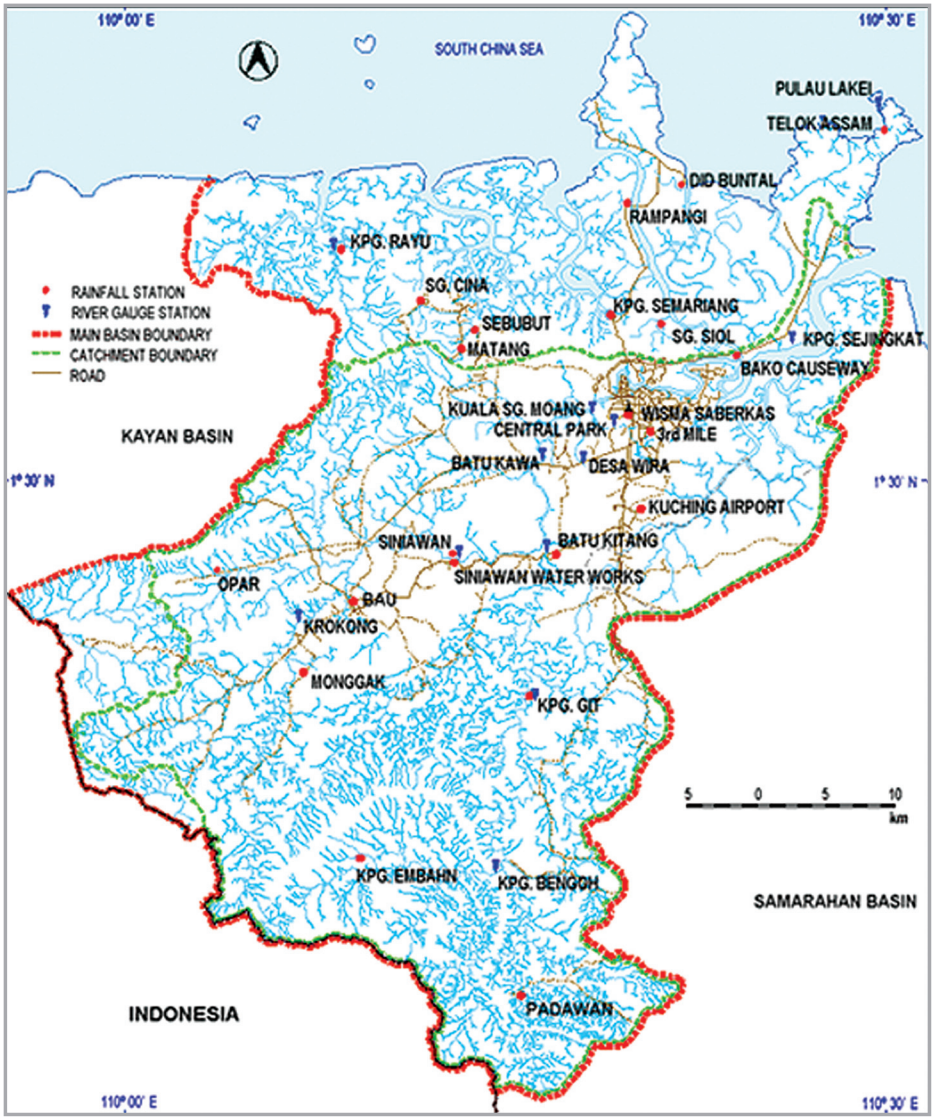

Figure 1: Sarawak River Basin [1]

INTEGRATED HYDROSYSTEM APPROACH FOR THE SARAWAK RIVER BASIN

The term 'hydrosystem' is used to describe collectively the technical areas of hydrology, hydraulics and water resources including the application of economics, optimisation, probability, statistics and management [2]. In the case of the Sarawak River Basin, the emphasis on the hydrosystem is given to the technicality of water resource development, wetland development (impact on hydrologic cycle) and the development of urban hydraulic infrastructures (e.g. sewerage system) to deal with the water quality deterioration due to rapid urbanisation. With this view, the issue regarding the water resource, wetland and urbanisation components could no longer be approached separately because of the inter-relation factors that will influence each other (Figure 2).

The concept of integration approach to these three components could be used to enable cooperation among the various agencies and stakeholders involved in decision making and support. The integration approach framework will allow for the information gathered to be shared among these various agencies to better manage the components.

LOGICAL FRAMEWORK AS AN INTEGRATION TOOL

The logical framework [4], commonly known as 'logframe', is a management and planning tool which links cause and

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Table 1: The Agencies and their areas of responsibility in the management and development of water resources in the Sarawak river basin

Agency/Department	Involvement
Department of Irrigation and Drainage (DID)	• Hydrology and water resources data collection • Total catchment plan studies (flood modelling and catchment modelling) • Irrigation and drainage works • Drainage master plan studies • River engineering • Coastal engineering • Technical advice (on hydropower project and also sand extraction)
Agriculture Department	• Drainage and irrigation • Crop water requirements • Soil conservation
Sarawak Tourism Board	• Promotion of tourism involving water recreation
Land and Survey Department	• Approving and licensing on sand extraction in river • Town and country planning
Forest Department	• Forest research • Logging impact • Sawmill pollution
Sarawak Rivers Board (SRB)	• Navigation • River cleanliness • River engineering • Terminal facilities • Erosion control • Sand extraction
Sarawak Marine Department (SMD)	• Hydrographic survey • Navigation
Sarawak Water Resources Council (SWRC)	• Policy for sustainable water development • Regulation
Natural Resources and Environment Board (NREB)	• Policy • EIA • Regulation
Kuching Water Board (KWB)	• Public water supply
Public Works Department	• Gazette water catchments • Investigate, design, construct and maintain civil works such as dam, wharves, bridges, etc • Water supply to rural area
State Planning Unit (SPU)	• Formulate state socio-economic development policies • Serve as secretariat to various planning council/committees at state level
Malaysian Meteorological Services (MMS)	• Provide data for rainfall and weather • Provide early warning on adverse weather phenomenon
Department of Environment (DOE)	• Water pollution regulation • EIA • Monitoring the environment
Medical Department	• Monitor water quality

Table 2: Logical framework matrix for water supply in the Sarawak river basin

Objective Summary	Objective Indicator	Means Of Verification	Assumption
Ultimate Goals 1. Improvement standard of living and sustainable development	1. Sarawak River cleanliness is maintained 2. Balanced water supply and demand	1. River Water Quality Monitoring Reports 2. KWB Annual Report	
Objectives 1. Sufficient water supply from Batu Kitang Water Treatment Plant (WTP) and salinity intrusion prevented 2. Dam Bengoh in operation	1.1 Clean Water quality standard is fulfilled, and 1.2 Raw water quality fulfilled the Interim National Water Quality Standard (INWQS), also for 3. 2 A number of new WTPs to increase capacity up to 1965 MLD for supplying beyond 2030	1.1 KWB Annual Report 1.2 River Water Quality Monitoring Report 2 WTPs Specification and KWB Annual Report 3 See 1.2 2.1 Laws of Sarawak 2.2 KWB report	**Objectives to ultimate goals** 1. Joint operation rule for Weir and Dam Bengoh to reduce upstream flood in conjunction with Weir Kiri crest level of 1.5m above MSL, and the used of Navigation lock at Weir Kiri for sediments flushing can be set up. 2. See 1 above, and fulfillment of EIA requirement
Outputs 1. Weir in operation 2. Construction of Dam Bengoh	1.1 Batu Kitang WTP capacity increase to 484 MLD for supplying beyond 2010 1.2 Raw water quality fulfilled the Interim National Water Quality Standard (INWQS) 2 Estimated Fund of RM 226.1 millions and Tender Document	1.1 Brief Notes (Ref.1) 1.2 Water Quality Monitoring Report 2 Proposed Bengoh Dam (Ref.2) and Construction Supervision Report.	**Outputs to Objectives** 1.1 Appropriate weir operation rule; 1.2 Operation of Navigation Lock at Kuching Barrage can be adjusted (due to the decreasing demand in inland navigation) to reduce saline intrusion; and 1.3 Riparian wetlands are conserved 2 Funds is available
Activities 1. Construction of Weir Kiri 2. Planning and design of Dam Bengoh 3. Clean River Water Movement. 3.1 Sewage and Wastewater Treatment Planning and Implementation 3.2 Restoration of abandon gold mining at the town of Bau	**Inputs** 1. Estimated budget of RM 22 million 2. Budget required 3. Budget required 4. Budget required 5. Other pre-condition requirement for 1, 2, 3 and 4	1. Brief Notes (Ref.1) 2. Proposed Bengoh Dam (Ref.2) 3. The study of Arsenic and Mercury Pollution of Tasik Biru and the Catchment of Bau and Siniawan Water Intake (Ref.3)	**Activities to Outputs** 1. Fund is available (also for 2, 3, and 4) 2.1 Approval of detailed design 2.2 Relocation of a few villages can be settled 2.3 Environmental concern with vegetation removal and construction of dam is applied as addressed in EIA

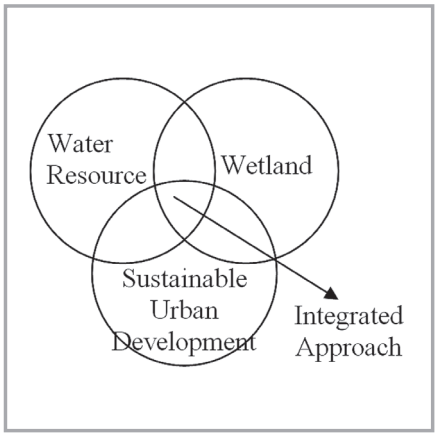

Figure 2: The Concept of Integration for the Sarawak River Basin [3]

effect through a hierarchy of objectives. It was first adopted by USAID in the early 1970s. Logical framework could be used as a tool in the integration approach to communicate effectively amongst the various agencies and stakeholders in developing and managing the components of water resource, wetlands and urbanisation in the Sarawak River Basin. Team effort is used to construct the logical framework through a series of workshops involving the various agencies and stakeholders.

A sample that shows part of the logical framework matrix that was developed by the authors for the water resource component in terms of fulfilling the needs for water supply is shown in Table 2.

CONCLUSION

Managing the conflicting needs of the Sarawak River Basin and, at the same time, balancing the development of the basin within the components of water resource, wetlands and urbanisation, is a challenging task involving various agencies and stakeholders. This paper proposed an integration concept for the management and development of these components for the Sarawak River Basin hydrosystem. Logical framework has been proposed as a tool to communicate among the various agencies and stakeholders in the management and sustainable development of the river basin. ■

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