

# **Integrated Water Resources Management Implementation for Langat and Sagami River Basins: A Comparison**

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## **Abstract**

In September 2015, the United Nations General Assembly adopted its 2030 Agenda for Sustainable Development that aims to achieve ambitious sustainability targets by 2030. In this Agenda, solving water and sanitation challenges is recognized as a top global priority alongside 16 other overarching Sustainable Development Goals (SDGs). The SDGs brought along an important question as to how to implement change. This study aims to determine the similarities and differences between Langat River and Sagami River Basins by examining the score of the degree of Integrated Water Resources Management (IWRM) implementation (i.e. score of 0-100) for both river basins. The objectives of this project are; i) to identify the key stakeholders relevant to the water governance in the Langat river basin and Sagami river basin, ii) to investigate the issues and challenges impacting Langat River basin and Sagami river basin and iii) to evaluate the degree of integrated water resources implementation (0-100) in Langat River and Sagami River basins. The study also analysed primary and secondary data obtained from interview, secondary data collection and surveys. The systematic studies provided may indicate the degree of IWRM implementation for both selected river basins.

**Keywords:** Sustainable Development Goal, Integrated Water Resources Management, Langat River Basin, Sagami River Basin

## 1. Introduction

In September 2015, the United Nations General Assembly adopted its 2030 Agenda for Sustainable Development that aims to achieving ambitious targets by 2030. In this Agenda, solving Water and Sanitation challenges is recognized as a top global priority alongside 16 other overarching Sustainable Development Goals (SDGs). Water and Sanitation is categorized under SDG 6, which is to ensure availability and sustainable management of water and sanitation for all. SDG 6 has 8 targets with 11 indicators [1]. Among those targets and indicators, this study focuses on SDG 6 Target 6.5 Indicator 6.5.1 – Degree of Integrated Water Resources Management Implementation. Integrated Water Resources Management (IWRM) is an integrated approach to solve water issues and challenge involving water management at all level [2]. It can be implemented for any kind of water resources. In this research, IWRM at river basin level is presented. As for comparison, the two river basins are selected each from Malaysia and Japan. Langat River Basin (LRB) and Sagami River Basin (SRB) are the selected study areas as both are located in urbanized areas surrounded with industrial activities.

Implementation of IWRM is important as water plays a crucial role for human survival, health and dignity and a fundamental resource for human development. The world's freshwater resources are under increasing pressure with lack access to adequate water supply for basic needs. Malaysia and Japan are not excluded from the water issues. Population growth, increased economic activity and urbanization that led to competition for and conflicts over the limited resources are the examples that contribute to water demand outstripping the water resources.

As the selected case study involving river basin, it is really important to know how the water management works on the river basin. On the river basin scale there are thus many elements that have roles and responsibilities for management of the environment and society, which are all linked to the status of the water resources [3]. For successful implementation of IWRM all these elements have to be involved. The intended key elements in this study are enabling environment, institutions and participation, management instruments and financing.

### *1.1 Research Objectives*

The objectives of this study are as follows:-

- i. To identify the key stakeholders relevant to the water governance for Langat River and Sagami River basins.
- ii. To investigate the issues and challenges impacting Langat River and Sagami River basins.
- iii. To evaluate the degree of integrated water resources implementation (i.e. range of 0-100) in Langat River and Sagami River basins.

## 2. Study Area

### 2.1 Study Area 1: Langat River Basin

The study area for Malaysia is Langat River Basin. Langat River has a total catchment area of approximately 2,350 km<sup>2</sup> with length of the Langat River, 200 km and it flows out of Klang Valley and ends to the Straits of Malacca. Langat River Basin is a unique and special basin in Malaysia because it straddles two states, Selangor and Negeri Sembilan, Federal Territories of Putrajaya [4]. The major water uses in Langat River Basin is divided by two: primary use for water supply and secondary use for aquaculture navigation [5].

The Langat River basin is the second largest river basin in the state of Selangor with second most rapid economic growth area in the country [4]. There is large scale social-economic projects are either currently taking shape or already completed in the basin. The projects include; the new township of Putrajaya (new Federal Government Administration Center), the Multimedia Super Corridor (MSC) for the information technology industry, Cyberjaya (the paperless electronic village and township), the Malaysian BioValley project for biotechnology research/industry, the Kuala Lumpur International Airport (KLIA), the Sepang Formula One Grand Prix Circuit and several other institutions of higher learning including universities [6].

The Langat River basin lies within latitudes 02° 50' 48" N and longitudes 101° 40' 48" E south of Kuala Lumpur, a capital city of Malaysia. The Langat River has few tributaries, out of them the main tributaries are Semenyih River, Lui River and Beranang River. The main river in the catchment is Langat. The catchment has two reservoirs located at the upstream of the Langat and Semenyih Rivers. These reservoir responsible to supply water to the treatment plants situated downstream of the catchment. The climate within the basin is tropical and equatorial with wet season varied between April to November and drier season from June to March [7].



**Figure 1.** Map of Langat River [8]

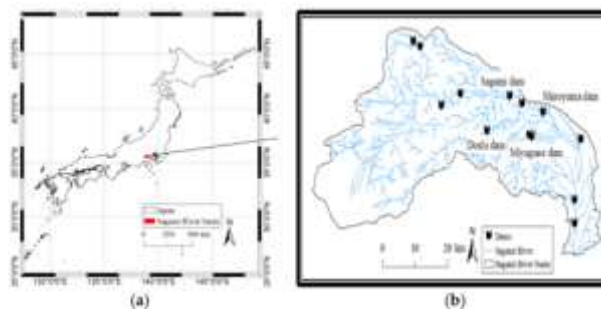
### 2.1.1 Water Resources Management in Malaysia

Water resources in Malaysia is managed by the Ministry of Water, Land and Natural Resources. The main objectives are to ensure the implementation of development policies in the power industry, water and green technology effectively and ensure the provision of comprehensive infrastructure, an integrated, standards and quality.

### 2.2 Study Area 2: Sagami River Basin

Sagami River is a Class A River, which is located in Kanagawa and Yamanashi Prefecture on the island of Honshu, Japan (see Figure 2). The Sagami River drains Lake Yamanaka the largest and easternmost of the Fuji Five Lakes in Yamanashi Prefecture. The length of Sagami River is 109 km with catchment area 1,677 km<sup>2</sup>. The Sagami River is a principal urban area in Japan runs north to south through central Kanagawa Prefecture with the national third largest population and economic activity [9]. Rui Liu stated that Sagami River known as the mother vein of Kanagawa Prefecture, it is not only a major water resources for 60% of water use but also a principal area for sightseeing and fishing. It lies within latitudes 35° 18' 55" N longitudes E 139° 22' 09" at central Honshu, Japan. The climate within the Sagami Basin is temperate and warm.

Sagami River Basins have three major dams which are Sagami Dam (multi-purpose dam), Shiroyama Dam, and Miyagase dam. The location of Sagami and Shiroyama dams are on the main stream Sagami River in Sagamihara, Kanagawa Prefecture on the island of Honshu, Japan, while Miyagase Dam located on Nakatsu River, the main tributary of the Sagami River in Aiko District, Kanagawa Prefecture on the island of Honshu, Japan (Figure 2). These three dams are interconnected via Doshi and Tsukui Headraces for integrated operations to assure effective use of water resources at Sagami River Basin. If there is water shortages, the dams at the mainstream will be the first to supply the water. In view of the condition of the reservoir surfaces, once 30% of the capacities of the dams in the mainstream have been used, Miyagase Dam will start to supply the water through Shiroyama Dam. When water is in short supply, each dam supplies water based on its capacity.



**Figure 2.** Sagami River Basin in Japan (a) Sagami River Basin; (b) Dams in Kanagawa Prefectures [10]

### *2.2.1 Water Resources Management in Japan*

The ministry involved in water related matter are Ministry of Health, Labour, and Welfare, Ministry of Agriculture, Forestry, and Fisheries, Ministry of Economy, Trade, and Industry, Ministry of Land, Infrastructure, and Transport (MLIT) and Ministry of Environment. Domestic water supply is under the supervision of Ministry of Health, Labour and Welfare whereas Ministry of Environment responsible for water quality, environmental conservation. Generally, water policies in Japan are still fragmented, except for the coordination among the central government and local governments during the drought/water shortages issues in Japan [10].

### *2.3 Integrated Water Resources Management*

According to Global Water Partnership (GWP), IWRM is a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment. The concept of IWRM was already recognized in Agenda 21 of the United Nations Earth Summit on Environment and Development that was held in Rio Janeiro in 1992.

In Malaysia, IWRM concept have been accepted as an innovative approach in managing water resources and first introduced in various forms in the early 1990s by Department of Irrigation and Drainage (DID), a water technical agency. At the basin scale such as Langat River Basin, a certain degree of activities pertaining to realizing goals of an IWRM approach have been implemented especially focusing on the Integrated River Basin Management (IRBM), another integrated approach in water management as a subset of IWRM based on river basin as a geographical unit or area, with the objective of balancing man's need with necessity of conserving resources to ensure their responsibility (Elfithri et al., 2011).

As for Japan, their (Japanese national) integrated water resources management plan called as Water Plan 21 is formulated with three basic objectives: 1) establishment of a sustainable water use systems, 2) conservation and improvement of the water environment and 3) fostering of water-related culture. Water Plan 21 identifies long-term water supply and demand prospects and means of improving water use stability through water efficiency measures and effective use of existing infrastructure [11]. According to H. Shimizu, Agenda 21 Katsura and Sagami Rivers is the first Local Agenda 21 in Japan to be formulated for a river basin and is noted for the involvement of more than one local government.

## **3. Materials and Methods**

This research is about comparison between river basins for two countries, Langat river basin and Sagami river basin in Malaysia and Japan respectively. The comparative analysis is the primary task within case study research. The underlying goal of comparative research is to find the similarity and variation between the selected case studies that are object of comparison.

For first objective, we intend to do snowball sampling as per done in the previous research involving comparative research on river basin management in the Sagami river basin (Japan) and the Langat river basin (Malaysia). The snowball sampling is where research participants recruit other participants for a test or study. It is used where potential participants are hard to find. In short, snowball sampling can be defined as a techniques for selecting research participants in a network, where it begins with one or a few people. It is also one of the techniques that is used to identify new potential stakeholders throughout the study tenure

until a theoretical saturation level is achieved. Thus, purposive and snowball sampling techniques will be used to select the key stakeholders for both selected river basins.

Our second objective is to address the issues and challenges impacting Langat river basin and Sagami river basin. In order to get the data, we plan to review the reports from both river basins, getting the information from the river basins website, online news and etc. As for clear and robustness of the statistical of problems occurred in both river basins, the interviews and field notes during the site visit to both river basins will be a greater contribution to achieve this objective.

The next and main objective in this research is to evaluate the degree of IWRM implementation (0-100) in LRB and SRB. The module of questionnaire will be prepared by accessing from UN Environment source as this is the standardized questionnaire for Target 6.5 Indicator 6.5.1.

#### 4. Preliminary Work

The previous study have been investigated the key stakeholder from Sagami River Basin, so we analyze the information of key stakeholder of Sagami River Basin to find the key stakeholder of Langat River Basin. We currently use the secondary data from the various journal, report and paper to identify the relevant stakeholders for this research as shown in Table 4. In the future, the snowball sampling techniques will be used to support the existing data. This will significantly increase the robustness of the objective.

We also investigate the general water issues impacting Langat and Sagami Rivers Basins. Generally, Langat and Sagami River Basins are not escape from facing the water quality degradation due to water pollution. That is one of the main issues for both river basin. This is just for sneak peek before we explore more in details. We need to find every single problems that affecting both river basin no matter what kind of aspect is it so that IWRM approach can overcome those issues. Hence, the specific issues and challenges within Langat and Sagami River basin will further investigate in the future.

**Table 4.** Key Stakeholders of Langat and Sagami River Basins

Sectors	Langat River Basin	Sagami River Basin
National Level	<ul style="list-style-type: none"> <li>• National Water Services Commissions (SPAN)</li> <li>• Selangor Water Management Authority (SWMA)</li> <li>• Department of Agriculture (DOA)</li> <li>• Department Of Irrigation and Drainage (DID)</li> <li>• Department of Environment (DOE)</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Land, Transport and Infrastructure</li> <li>• Ministry of Health, Labor and Welfare</li> <li>• Ministry of Economy, Trade and Industry</li> <li>• Ministry of Agriculture, Forest and Fisheries</li> </ul>
Prefectural/state government	<ul style="list-style-type: none"> <li>• Selangor, Negeri Sembilan &amp; Federal Territories of Putrajaya</li> </ul>	<ul style="list-style-type: none"> <li>• Yamanashi and Kanagawa Prefectural government (Yokohama City)</li> <li>• Katsuragawa-Sagamigawa River Basin Council</li> </ul>

Environmental NGO	<ul style="list-style-type: none"> <li>• Friends of Langat River</li> </ul>	<ul style="list-style-type: none"> <li>• Citizens' Networking Sagami River (CNS)</li> </ul>
Water supply agencies	<ul style="list-style-type: none"> <li>• Selangor Water Management Authority (SWMA)</li> </ul>	<ul style="list-style-type: none"> <li>• Yokohama Waterwork Bureau</li> </ul>
Industry	<ul style="list-style-type: none"> <li>• Industrial Park Hulu Langat</li> </ul>	<ul style="list-style-type: none"> <li>• Yokohama-Kanagawa industrial belt</li> </ul>
Tourism	<ul style="list-style-type: none"> <li>• Tourist-local or international</li> </ul>	<ul style="list-style-type: none"> <li>• Tourist-local or international</li> </ul>
Local	<ul style="list-style-type: none"> <li>• Residents of Selangor, Negeri Sembilan and Putrajaya</li> </ul>	<ul style="list-style-type: none"> <li>• Residents of Yamanashi and Kanagawa Prefecture, farmers, fishermen.</li> </ul>

## 5. Conclusion

The research areas are Langat River Basin and Sagami River Basin and the stakeholders for both river basin are identified. The general issues and challenges impacting for both river basin are urbanization, water pollution, climate change and water demand. The degree of IWRM implementation (0-100) in Langat and Sagami River Basins will be evaluated through a module of questionnaires.

### 5.1 Future Work

For future work, the snowball sampling techniques will be used to get a valid data of key stakeholders for both river basins. We will also investigate the issues and challenge of both river basin in details by reviewing the reports from both river basins, getting the information from the river basins website, online news and etc. The interviews and field notes during the site visit to both river basins is method added to get a clear and robustness of the statistical of problems occurred in both river basins, The interview and questionnaire also will be conducted to achieve objective 3 which is to evaluate the degree of IWRM implementation (0-100) for both river basin.

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