

## The Role of Natural Capital for Ecosystem: Focusing on Water Resource in Pahang, Malaysia

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**Abstract:** Natural capital is stock of natural assets and environmental resources that provides useful goods and services for fulfilling present and future needs. Water is an important natural capital for ecosystem services in every country to ensure drinking, sanitation, navigation, fisheries, irrigation, recreation and commercial activities. About 95% of water source comes from inland rivers in Malaysia. The water resources of Pahang are very important natural capital for Malaysia. The present study analyzes the potential of water resources for ecosystem in Pahang. The study used secondary sources such as policies, acts, data and regulations from relevant ministries and agencies of the Malaysian Government. The scenario are revealing water supply will excess in Pahang according to demand until 2050. Water resource are potential for ecosystem service in Pahang in terms of economic and social well-being, necessary for development, ecological soundness, beneficial and agricultural use, preserve flora and fauna, support ecological habitats, protect wildlife resources, treasure of fishery resources, rich biological resources and socio-economic benefits. There are several initiatives such as ensure effective water management, give priority in policy making, keep the integrity of ecosystem and natural capital, preserve surface and ground water, identify water resources and establish protective forest system can be taken to protect and maintain the sustainable utilization of water resources of Pahang.

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### 1. Introduction

The meaning of natural capital is defined into several categories by different researchers. One group defines natural capital as the stock of natural assets and environmental resources that provides useful goods and services for fulfilling present and future needs (World Bank, 2012). Another group give emphasize on ecosystem for maintaining effective support between natural capital and productions (United Nations, 1997; Hackett, 2001). The third group identifies natural capital as life support system and necessary survival elements for our life (Government of Canada, 2012). The fourth group emphasized on the benefits of nature based economic activities and direct utility of nature through visual and spiritual appreciations (Lantz, 2005; Conservation Economy, 2006).

The researchers have embraced broad scope of natural capital through their definitions. Natural capital covers renewable, non-renewable, tangible and intangible assets, market and non-market activities which ensure sustainable living systems and survival of life. In Canada, for example the National Roundtable on the Environment and the Economy (NRTEE) proposed five indicators for natural capital. These are air quality, freshwater quality, greenhouse

gas emissions, forest area and the amount of wetlands (Government of Canada, 2012). Again, natural capital defined as the reserve of environmental assets such as oceans, forest resources and agricultural land for utilization in present and future (Daly, 1994).

Some researchers (Pearce and Turner, 1990) also describe natural capital as ecological and ecosystem capital which involves several environmental functions. The function are stipulation of resources for production, inclusion of waste from production, comprises basic life support activities such as ecosystem and climate stability and ensure environmental activities for contributing human welfare. Natural capital includes some valuable assets for any country such as water, forest, agriculture land, fisheries, fossil fuel and mineral resources (Bhuiyan et al., 2013). Natural capitals have direct-use values in different forms. They have provisioning services such as, crops, timber; ecosystem processes such as, erosion, climate and cultural services such as, recreation, sense of identity, visual values (Millennium Ecosystem Assessment 2003). Bhuiyan et al. (2013a) pointed that natural capital is important resource in Malaysia for achieving sustainable development which remain principal source of revenue for the federal and state government.

According to Berkes and Folke (1994), natural capital consist three main components. They are non-renewable resources extracts from ecosystems, renewable resources produced and maintained by ecosystems and environmental services. The ecosystem goods and services are important sources of economic growth and wealth of a nation. Ecosystem services include provisioning, cultural and regulatory activities. Provisioning services such as food, freshwater, wood and fuel; cultural services are including aesthetic, spiritual, educational and recreational activities. Moreover, regulatory services are climate regulation, flood regulation, disease regulation and water purification.

About 95% of water source comes from inland rivers in Malaysia. The water demands are increasing sharply for industrialization, infrastructures and urban uses towards its vision 2020. Malaysia has preserved current water resources to improve the water quality for maintaining water demands (Muyibi et al., 2008). Pahang is the largest states in Peninsular Malaysia. The total population in the year 2010 was 1.57 million in Pahang. In 2010, GDP of Pahang was RM 12.68 billion. The average rainfall is about 2,800 mm. The mean temperature is about 26<sup>o</sup> C, with an average humidity of about 86%. Pahang is rich in water resources. The Sg. Pahang, Sg. Rompin and Sg. Kuantan are the three main rivers of this state and their combined catchment produce an average annual runoff of about 90,000 million liters per day (ECER, 2007). The neighboring two States- Selangor and Negeri Sembilan will be depended to Pahang for supplies water to meet their future increases in demand. So, the water resources of Pahang are very important natural capital for Malaysia.

The present study analyzes the potential of water resources for ecosystem in Pahang. The study also highlights the relevant issues and challenges in this regard.

## 2. Methods

The study used secondary sources such as policies, acts, data and regulations from relevant ministries and agencies of the Malaysian Government. Published materials such as relevant research reports, articles, books, annual reports also are reviewed in order to accumulate secondary data.

## 3. Results

Water is an important natural capital for most economic activities, energy source, and fish grow; a strength agent for wastes and pollutants; food and fiber production sources in arid and semi-arid areas. Today, water availability is fundamental responsibility for every country's government to ensure drinking, sanitation, navigation, fisheries,

irrigation, recreation and commercial activities. The prosperity, national wealth and well-being of every nation are affected by the availability of water (Perry, 2012). Water quality captures the effects of natural capital and many constituents of human well-being. Water plays crucial role in the ecosystem services. Ecosystem needs water to provide social, ecological and hydrological functions. On the other hand, healthy ecosystems help to ensure water availability for proper functioning (Figure-1).

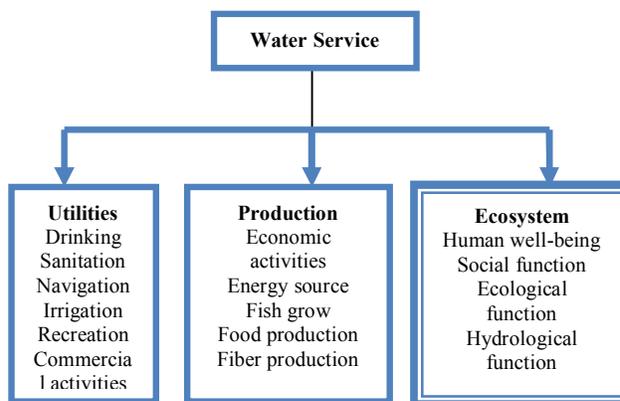


Figure 1: Water service system as natural capital

Table-1 shows the prediction summary of demand and supply of water in Pahang. On the base year 2010, the predicted demand of water will be 1656 mld, 2142 mld, 2703 mld and 3138 in the year 2020, 2030, 2040 and 2050 respectively. On the other hand, the predicted supply of water will be 2488 mld, 2955 mld, 3255 mld and 3311 mld in the year 2020, 2030, 2040 and 2050 respectively. The scenario are revealing water supply will excess in Pahang according to demand.

Table 1: Water demand and supply in Pahang  
(Million liters per day)

	2010	2020	2030	2040	2050
Demand	1210	1656	2142	2703	3138
Supply	2090	2488	2955	3255	3311

Source: Compendium, 2012

Table-2 presents the water treatment plants design capacity in Pahang. In 2007, treatment plants capacity were 1,176 mld and it reached 1,203 in 2011. This scenario indicating that treatment water can fulfill most of the demand of this state. Moreover, total production of water supplied was 890 mld and 1079 mld in the year 2007 and 2011 respectively (Table-3). From this picture, large portion of demand water can be come from production in this state.

Table 2: Water treatment plants design capacity, 2007-2011 (Million liters per day)

	2007	2008	2009	2010	2011
Malaysia	15,738	15,891	16,403	16,779	17,421
Pahang	1,176	1,195	1,197	1,184	1,203

Source: Compendium, 2012

Table 3: Total production of water supplied, 2007-2011 (Million liters per day)

	2007	2008	2009	2010	2011
Malaysia	12,827	13,213	13,495	14,110	14,564
Pahang	890	915	915	966	1079

Source: Compendium, 2012

Table-4 shows that raw water supplies from the rivers are increasing year by year in this state. As a result, the state is depending on river water to fulfill the demand. Moreover, the contribution of raw ground water is small portion in Pahang (Table-5). But it increases highly in the year 2010 (28 mld) and 2011 (29 mld) comparatively the year 2007

Table 4: Supply of raw water extracted directly from rivers, 2007-2011 (Million litres per day)

	2007	2008	2009	2010	2011
Malaysia	12,007	12,418	12,398	12,516	12,746
Pahang	947	971	1,090	1,035	1,051

Source: Compendium, 2012

Table 5: Supply of raw groundwater, 2007-2011 (Million liters per day)

	2007	2008	2009	2010	2011
Malaysia	185	195	185	204	223
Pahang	6	6	4	28	29

Source: Compendium, 2012

#### 4. Discussions

Water resource is one of the important natural capitals for Pahang in terms of sustainable manner. The potentials of water resources for ecosystem services in Pahang are as follows;

**Economic and social well-being:** Good environmental quality of freshwater maintaining the integrity of ecosystem which leads social and environmental well-being of people. Integrated ecosystem ensures sustainable conservation and safeguard water resources.

**Irrigation for agriculture:** Irrigation is the largest single use of water resources in Malaysia. It is an essential regional issue for Pahang that primarily

used in rice-growing purpose in this state. Irrigation has a significant impact on the ecosystem of an area as well as industrial and domestic uses of water.

**Necessary for development:** Fresh water is the major limitation for the sustainable development in many countries. In dry and semi-dry countries, environmental awareness is needed for accelerating the demand for water (Kirmani and Moigne, 1996).

**Ecological soundness:** Favorable water quality and sufficient water are ensuring ecological soundness in an area. In order to ecological soundness, proper water management based on necessary knowledge, ecology of the water bodies, structural organization of ecosystem, sustainable use of water and favorable quality of water are essential requirements (Timchenko et al., 2000).

**Beneficial uses:** The main source of water is rivers in Pahang. The rivers are sources of raw water for domestic, industrial, commercial and irrigation purposes. The rivers are receiving waters for treated domestic sewage and industrial effluents. They are also sources for local fishing and recreational activities.

**Preserve flora and fauna:** A large part of the state (66%) is still forested. These forest areas are full of rich and diversified flora and fauna. Water resources are preserving them without any disturbances.

**Support ecological habitats:** Pahang has a high diversity of plants and animal communities with varied topography and soil characteristics. The rivers of the state are supporting these diverse ecological habitats.

**Protect wildlife resources:** The forest and reserve areas of Pahang are full of rich diversity of global faunal life. These areas include a large number of rare and internationally recognized endangered species. Water bodies of this state are protecting these valuable resources.

**Rich biological resources:** The forest streams, rivers, lakes and water bodies of Pahang are rich biological resources which provide diverse freshwater habitats and ecology. These resources are occupying important positions in the food chains.

**Treasure of fishery resources:** The water bodies of Pahang are treasure of rich and diverse freshwater fishes. The mangroves, peat swamps and coastal areas are providing ideal breeding, nursery and growing grounds for many crabs, prawns and fishes.

**Socio-economic benefits:** Water resources are ensuring socio-economic well beings and development of Pahang. The fishing communities carry out fishing in the South China Sea, rivers and other water catchments. Farmers are cultivating crops by irrigation from water bodies. The Orang Asli (indigenous people) communities are depending on

water resources for their daily needs and livelihoods in the state. Moreover, water bodies are potential components for tourism and recreational facilities in this state.

### 5. Recommendations

In order to protect and maintain the sustainable utilization of water resources of Pahang, the following initiatives can be taken as recommendations.

- To maintain security and sustainability of water resources should be priority in national level and policy making.
- To ensure sustainable use, preserve, conservation and effective management of water resources by involving all stakeholders.
- To protect the integrity of the environment, ecosystem and natural capital
  - To preserve surface and groundwater and protect water environment
  - To minimize water related hazards by protecting natural flow and biodiversity
  - Identify and recognize water resources for environmental well being and sustainable use in present and future.
  - To establish protective forest system to conserve water in the river basin areas.

### 6. Conclusion

The natural resource protection and development of a country depends on the sustainable utilization of natural capitals. Natural capital can be ensuring social, environmental and economic well beings of an area as well as local communities. It can preserve ecosystem and biodiversity by several environmental activities. Water resource is potential and profitable natural capital for Pahang as well as Malaysia. In near future, water demand of Peninsula Malaysia will be fulfilled by excess water supply of Pahang. With the ensuring awareness over environmental issues that water resources must be utilized in an environmentally sustainable manner. Finally, develop partnership among the stakeholders, increase institutional capacity, knowledge and information sharing regarding resources and collective efforts are necessary for effective role of water resources in ecosystem service in Pahang.

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