

Water Resource Efficiency towards Sustainable Tourism at Patong Municipality, Phuket Province, Thailand

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Abstract—Tourism is one of the main incomes of Thailand that directly contributes to the national Gross Domestic Product (GDP). Tourism affects not only on economic sector but also on the environment and society. Sustainable tourism (ST) has become more important in conserving and maintaining natural resources for the next generation. The ST requires efficient uses of natural resources, particularly water resource. The objective of this research is to study water resource efficiency towards sustainable tourism at Patong Municipality, Kathu district of Phuket. Water shortage has taken place in Patong municipality for decades. A set of semi-structure questionnaires was used to in-depth interview respondents selected by using a purposive sampling method. The total respondents were 44 composing of 4 groups including hotel business, local community, governmental organization, and tourism-related association. Data obtained were analyzed using descriptive and content analysis methods. The study found that the Phuket Provincial Waterworks Authority (PPWA) and the Patong Municipality are two major water suppliers in Patong municipality. 50% of respondents used water from the PPWA, while 13.51% of them used water from the Patong Municipality. However, 43.24% of them also obtained water from shallow well, natural canal, village water supply, groundwater, and purchasing water. 89.18% of respondents faced with water shortage yearly that be solved by collecting rainwater in bigger storage tanks. Concerning water usage leading to sustainable tourism, water saving, efficient water use and water treated reuse for gardening would be powerful actions. The environmental awareness would play a vital role on water use for sustainable tourism. Therefore, a stronger collaboration among stakeholders including governments, state-enterprises, private sectors and all local people would sustainably reduce water shortage in Patong municipality.

Keywords— *Water Resource Efficiency; Sustainable Tourism; Patong Municipality, Phuket Province*

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I. Introduction

Tourism is one of the largest economic sectors around the world. The percentage of global Gross Domestic Product (GDP) on tourism in 2017 was 10.4% [1]. Similarly, tourism in Thailand is one of the main national incomes which directly contributed 9.4% of total GDP in 2017. Tourism in Thailand affects not only on economic sector, but also on environment and society. The practicing of sustainable tourism has become more and more important in conserving and maintaining natural resources in good conditions for the next generation.

Sustainable tourism (ST) requires an efficient use of natural resources, particularly water resource [2]. One of the principles of sustainable tourism stated by the United Nations World Tourism Organization (UNWTO) is resource efficiency (RE) [3]. RE consists of water resources, energy and wastewater. Therefore, the efficiency of water use would lead to sustainable tourism.

Phuket is one of the popular tourist destinations in Thailand. The number of tourists in Phuket have increased each year [4]. This reflects to resource consumption increasing, particularly water resource that is an important resource for tourism activities. This makes water demand in Phuket increases about 2% each year [5].

Patong Municipality is located in Kathu district of Phuket province. Regarding to the statistical data of water use in Patong in 2012, the actual water use was 2,549 cubic meters per day while the demand of water use was higher at amount of 4,460 cubic meters per day [6]. Therefore, water shortage is a main issue in Patong municipality, and it still occurs today.

The questions on how to sustainably use water and how sustainable water use leading to sustainable tourism were of interest. Therefore, the objective of this research is to study water resource efficiency for sustainable tourism at Patong municipality, Phuket province, Thailand.

The study area is Patong Municipality, Kathu district of Phuket province which is located between 7°53'35"N latitude and 98°17'54"E longitude as shown in Figure 1. It is a popular tourist destination. The Patong Municipality area covers 16.4 square kilometers [7]. It composes of 7 villages, namely Chaiwat, Baan Mon, Sai Namyen, Nanai, Baan Khok Makhm, Baan Kalim, and Patong Beach villages [7]. Water shortage has taken place in Phuket for decades due to water demand is higher than water supply [8].

The average annual rainfall of Phuket was 2,347 mm and the average annual maximum rainfall was 113.6 mm between 2003 and 2015 [9]. Even though Phuket has a long period of

rain, water shortage still occurs [8]. The study area is shown in Figure 1.



Figure 1. The study area; Patong municipality (red shade), Phuket province, Thailand (Modified from the Tourism Authority of Thailand, Phuket Office, 2016).

II. Methods

The respondents of the study were considered based on the research objective. They were selected by using the purposive sampling method, which concentrates on people with particular characteristics who will better be able to assist with the relevant research [10]. The total respondents were 44 composing of 4 groups, namely hotel business, local community, governmental organization, and tourism-related association. The data were obtained by the in-depth interview using a set of semi-structured questionnaire which composes of general information of respondents, water use in Patong Municipality and water use towards sustainable tourism in Patong Municipality. Data obtained were analyzed using descriptive and content analyses

III. Results and Discussions

A. Demographic of respondents

The respondents were male of 59.09% and female of 40.91%. The ages of the respondents were divided into five groups. 29.54% of the respondents were in the age range of 51-60 years old, 27.27% of them were in the range of 41-50 years old. 25.00% of them were in the age range of 31-40 years old and 11.36% of them were in the age range of 61 years old and above. Only 6.81% of them were in the age range of 18-30 years old. In terms of education, 31.81% of respondents graduated at the level of a bachelor's degree, following 29.54% at the level of a higher vocational certification. The occupations of the respondents were chief engineers (31.81%), heads of villages (15.90%), government officers (9.09%) and the rest were nongovernmental organization (NGO) officers, hotel owners, restaurant owners, and employees.

B. Water use and water supply

The data obtained from the interviews presents that the Phuket Provincial Waterworks Authority (PPWA) and the Patong Municipality are two main water suppliers in Patong municipality with production capacity of 136,200 and 6,000 cubic meters per day, respectively. The PPWA's raw water comes from the Bangward reservoir, the Bang Nheaw Dhum reservoir, the Klong Katha reservoir, the Kathu waterfall, and abandoned mines. The Patong Municipality supplies water to hotel businesses only. Its raw water comes from treated water, mountain springs, groundwater, and reverse osmosis (RO) water.

The study found that 50% of respondents used water from the PPWA, while 13.51% of them used water from the Patong municipality. In addition, 43.24% of them mentioned that they also obtained water from shallow well, natural canal, village water supply, groundwater, and purchasing water. Regarding village water supply, only Kalim village is under this service.

For hotel businesses, 27.27% of respondents from hotel businesses used water from the Patong Municipality. The study found that they relied on the Patong Municipality's

water supply than the PPWA's water supply during the dry season. They stated that water supply from the PPWA is not reliable, especially in the dry season.

In terms of water use problems, water shortage is a common problem taken place in the study area. Globally, the competition of water has significantly increased in recent years [11]. The increasing of population and development would lead to water shortage [12]. The numbers of tourists visiting Phuket also increased from 12,520,769 in 2015 to 13,410,658 in 2016 [4]. Therefore, water shortage in Phuket would be occurred due to the increasing number of tourists. 89.18% of respondents faced with water shortage annually. They solved this problem by collecting more rainwater in bigger storage tanks. All hotel businesses (100%) also have a problem on water shortage. The second common problem revealed by 40.54% of all respondents was water quality. Only 16.21% of them were able to solve this problem by installing a strainer.

C. Practices on sustainable water use

According to the current practices, 70.27% of the respondents did not reuse water at all. Only 29.27% of them reused water for their gardening. Resource-efficiency technology in water supply and treatment such as wastewater treatment could hugely save a lot of water [13]. All hotel businesses reuse water from their wastewater treatment for gardening. 43.75% of respondents checked water leakage to prevent water loss. Using water-saving devices in the toilets, taps, and showers would also help reduce water use. Using low flush toilets daily would save about 7-9 liters per flush [14]. The study found that 68.18% of hotel businesses use devices such as tap sensor, showerhead, and flush sensor to save water leading to sustainable water use in their businesses. 43.75% of them checked water leakage in order to prevent water loss. While 20% of them adjusted water tap valves to reduce water leakage.

D. Sustainable water use towards sustainable tourism

Water resource is one of the important resources to lead to sustainable tourism in the study area [6]. The study found that 82.92% of respondents knew that sustainable water use would lead to sustainable tourism, while 17.07% of them heard about sustainable tourism but did not understand its concept or meaning. Regarding the rapid expansion in tourism sector in Patong municipality, 70.27% of respondents stated that the number of tourists has increased rapidly. The World Bank mentioned that expansion of tourism sector could lead to water shortage [15]. Therefore, the number of tourists in an area would be an important factor to lead sustainable water use for sustainable tourism.

All respondents (100%) from governmental agencies stated that water supply is an important driving factor contributing to sustainable tourism. The study found that 34.04% of all respondents stated that more assistance in water supply from governmental agencies would help sustain water usage for sustainable tourism.

In terms of measures and policies on water use for sustainable tourism, 58.53% of respondents revealed that there are no policies and measures on water use for sustainable tourism in the study area, while 41.46% of them stated that they have their own measures including routine leakage checking (17.07%) and turning off water when not in use (9.75%). Water leakage is a key concern in sustainable water use for sustainable tourism [16]. Therefore, checking for water leakage frequently would help prevent water loss.

The study also found that the PPWA has planned to buy more water from a private company of 12,000 cubic meters per day and to install a water piping line from Kamala sub-district of 2,400 cubic meters per day. Hotel businesses have conducted some environmental programs such as the Planet 21 (water, oil, gas, and water usage), the Green hotel, the Green Leaf and the Kin-Na-Ree programs. The Green Suites mentioned that environmental programs could raise awareness of people to concern more about conserving water [17]. Therefore, hotels that conducted environmental programs would be able to use water resource efficiency.

In addition, the government agencies suggested that the stronger collaboration among all stakeholders including governments, state-enterprises, private sectors and local people would reduce water shortage in Patong municipality. All respondents (100%) also suggested that the government should make a contraction with abandon-mined owners to use water from such mines.

According to the European Commission, reusing water and collecting rainwater could help sustain water use [16]. Improving water resource efficiency means reducing the intensity of water use improving technical efficiency of water services [18]. In this regard, all respondents (100%) also stated that water saving, efficient water use and water treated reuse for gardening would help sustain water use for sustainable tourism in Patong municipality. This would be powerful actions leading to sustainable tourism.

To make water resource efficiency towards sustainable tourism in the study area, all related stakeholders including private and public sectors, tourism businesses, tourism-related associations, entrepreneur, small business, and local people have to take actions to comply with laws and regulations of the City Planning, B.E. 2548 (A.D. 2005) issued under the City Planning Act B.E. 2518 (A.D. 1975), the notification of Ministry natural resources and environment RE: Territory and environment protection measure for Phuket B.E. 2546 (A.D. 2003), the Patong Municipality's by law regulations RE: Prohibition of construction and modification or change the usage of certain types of buildings in the area of Patong Municipality, Kathu district, Phuket B.E. 2548 (A.D. 2005), the Ministerial Regulation No.20 B.E. 2532 (A.D. 1989) and No.15 B.E. 2529 (A.D. 1986) issued under the Building Control Act B.E. 2522 (A.D. 1965) [19]. Legality would benefit to the development of Patong Municipality in terms of enhancing economic, social and environmental conditions [20]. Therefore, a strict compliance with relevant laws, regulations, and policies on land-use planning would be a powerful action to sustain water usage for sustainable tourism.

IV. Conclusions

Patong municipality has affected on water shortage for decades. Concerning water usage leading to sustainable tourism, water saving, efficient water use and water treated reuse for gardening would be powerful actions. Environmental awareness would play a vital role on water usage for sustainable tourism. The strong collaboration among stakeholders including governments, state-enterprises, private sectors and all local people would sustainably reduce water shortage in Patong municipality. Relevant laws, regulations, and policies on land-use planning should be strictly proceeded for water resource efficiency towards sustainable tourism.

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