

**THE WATER FOOTPRINT ASSESSMENT OF HOTEL TYPE1 IN
BANGKOK**



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**A Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of
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2019**

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ABSTRACT

Title of Dissertation	THE WATER FOOTPRINT ASSESSMENT OF HOTEL TYPE1 IN BANGKOK
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The findings were as follows. Policy makers revealed that in Thailand environmentally-friendly labels and awards have attracted little awareness and recognition, especially among small- and medium-sized hotels. The key factors leading to the successful application of water footprint included executives, and promotional measures to encourage motivation. The factors that posed obstacles to the application of water footprint was the unpreparedness of employees both in terms of knowledge and the number of employees, as well as communication requiring simple language for acknowledgement and understanding. Furthermore, green award-winning hotels formulated water preservation policy as part of their overall policy platform; hotel owners and executives were essential to success; knowledge of water conservation through training for new and old employees; use of technology, water-saving equipment, and guidelines and methods of water preservation; and most Green Hotels were interested in water footprint assessment. Moreover, water footprint assessment of hotels type 1 in Bangkok (volume of the use of water of one guest per night) indicated that more than half of the water use of hotels was poor according to the benchmark for fresh water use in guest room based on good = less than 300, fair = 300-350, poor = greater than 350 liters per guest night (The International Business Leaders Forum's Tourism Partnership, n.d.).

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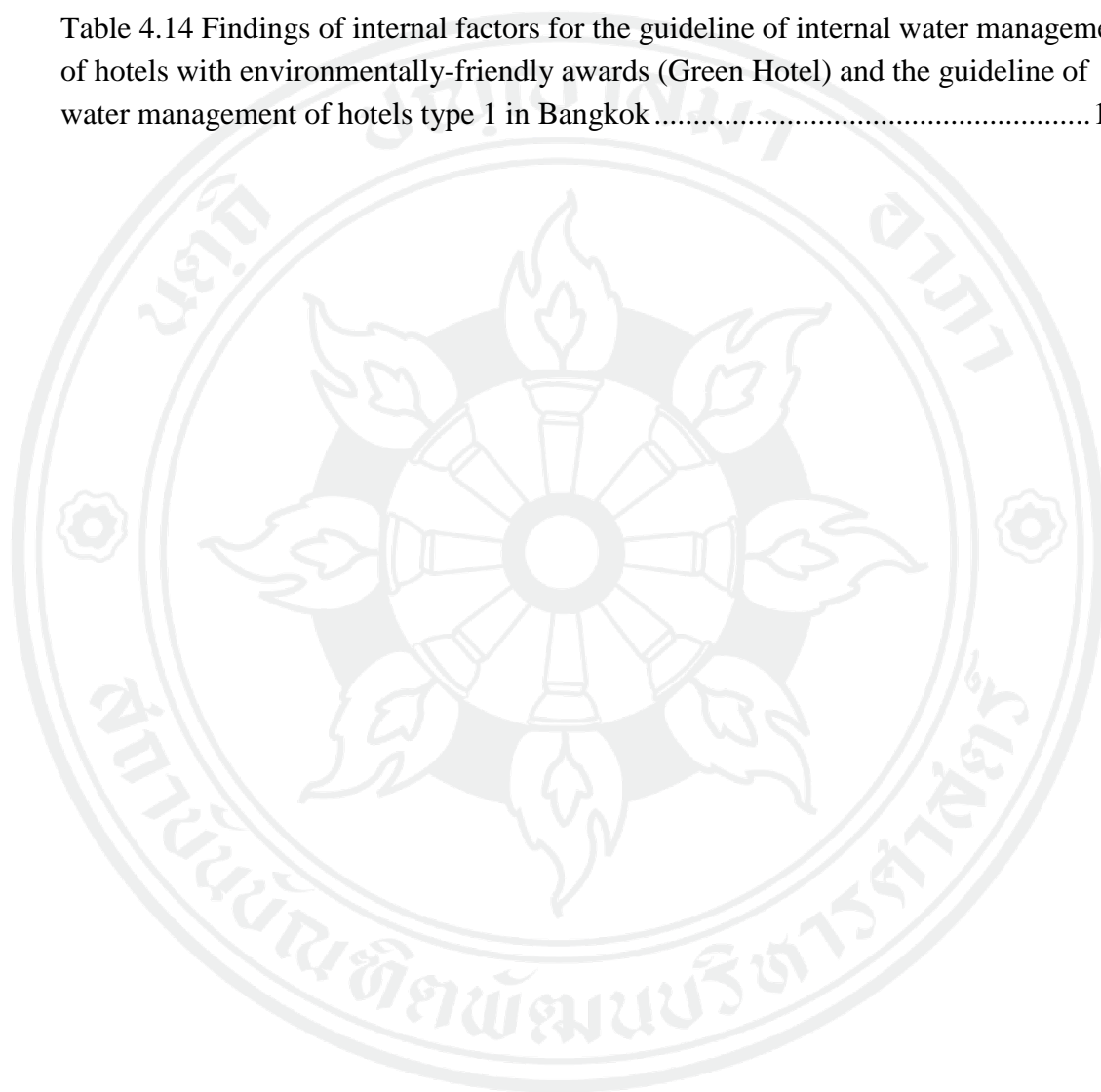


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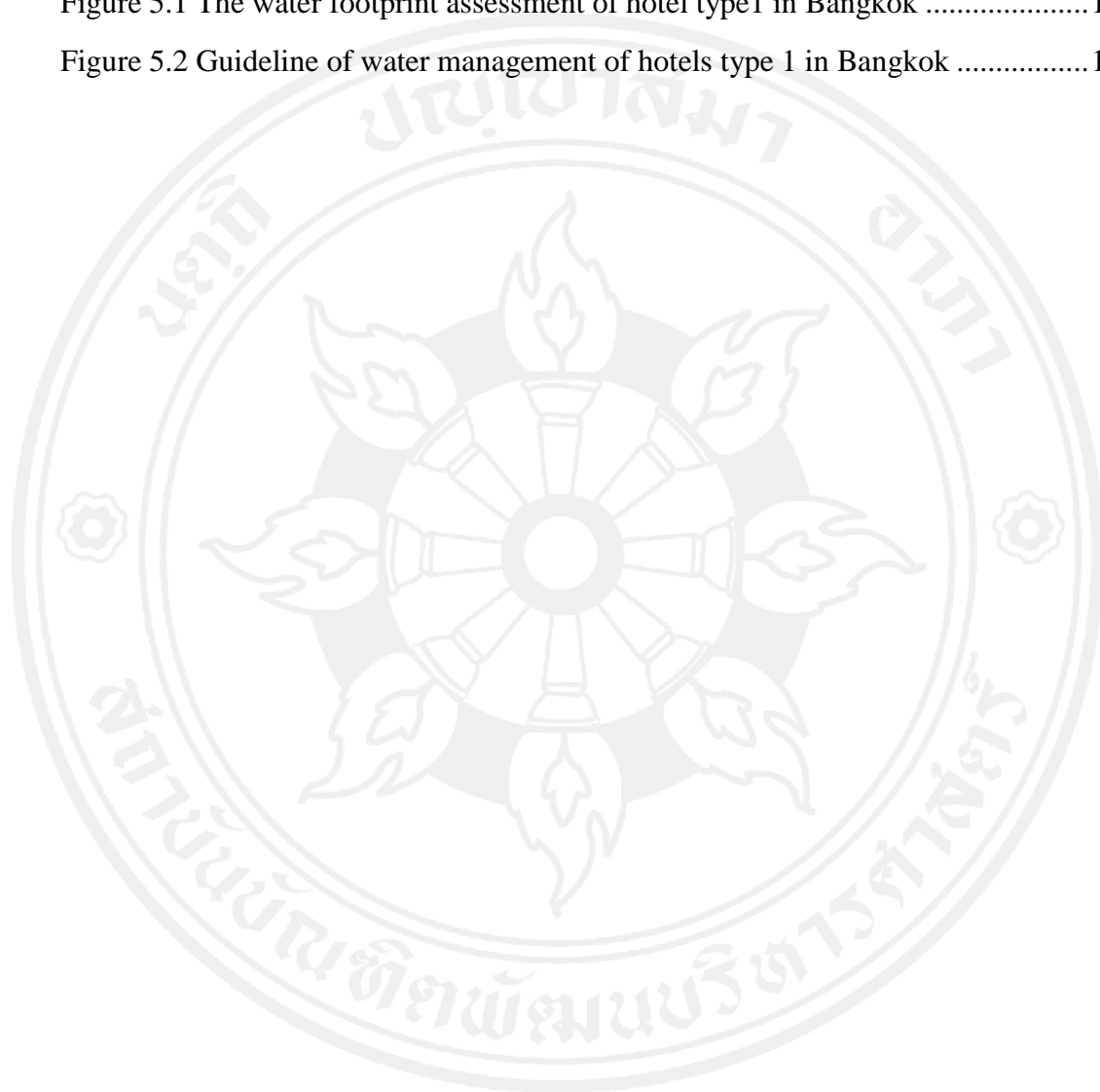
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CHAPTER 1

INTRODUCTION

1.1 Background and Significance

Water resources are crucial to living creatures and indispensable to humans, animals, and plants that need to consume water to maintain themselves and support their functions and activities. Water covers approximately three-quarters of the earth's surface. Out of this amount, saltwater constitutes as high as 97.5% of the total, while freshwater accounts for only 2.5%. The exploitable amount of fresh water constitutes only 0.08%, the rest being locked in the form of icecaps and glaciers (National Statistical Office, 2018). Presently, the demand for water is increasing in line with the increased global population. In 2014, 2015, and 2016, the global population increased from 7.269 billion to 7.355 billion and to 7.442 billion respectively (The World Bank, 2017b). During the same time, the global economy experienced continual growth, with GDP expanding in the range of 2.4- 2.8% annually. (The World Bank, 2017a) The concomitant increased water consumption inevitably produced wastewater as 80% of used water would become wastewater. Although the water resource is renewable according to the water cycle, environmental problems such as global warming have caused climate change and natural disasters including climate fluctuations, flood, and drought leading to social, economic, and environmental impacts. Therefore, people worldwide have realized the importance of the preservation of natural resources and the environment for more sustainability. In parallel, the United Nations (UN) has defined the Sustainable Development Goals (SDGs) in economic, social, and environmental dimensions for the period September 2015 to August 2030.

SDG Goal 6 addresses sustainable water, sanitation management, and problems of water shortage which have affected 40% of the world population. According to Goal 6, by 2030 safe water must be provided at a reasonable price and efficient water use

must be promoted (Pollution Control Department, 2005; United Nations Thailand, 2016). In response, Thailand has implemented the 20-Year National Strategy (2018-2037) to meet the UN's SDGs as well as using the SDGs as a framework to formulate various plans in line with national strategies. One of the national strategies on the environment is Strategy 5: Creation of growth based on environmentally-friendly quality of life. The 12th National Economic and Social Development Plan (2017-2021) defined the increased efficiency of water management for security, balance, and sustainability, both in terms of quantity and quality. It also promoted environmentally-friendly production and consumption, and supported the issuance of carbon footprint labels, green labels, and other environmental labels, leading to the establishment of environmental footprint standards (Office of the National Economic and Social Development Board, n.d.) Water resource was therefore deemed as crucial, with a management strategy devised at both national and international levels. At the same time, due to the growth of the tourism industry in Thailand as a result of the increasing number of foreign and local tourists alike, it became necessary to take into account water management to be able to accommodate the growth of the tourism industry.

In regard to global tourism, according to the United Nations World Tourism Organization (UNTWO), since 1990, global tourists have continually increased. It is forecast that by 2030, tourist numbers will reach 1.8 billion with an average growth of 3.3% a year. Therefore, the tourism industry has grown and assumed a prominent role in the economy of numerous countries. The trend toward competition in tourism will increase as well in the future. As for the situation of tourism in Thailand, it is forecast that growth will continue for the next 15 years. In 2014, there were 24.7 million tourists. It is expected that in 2020 the tourists will increase to approximately 45 million, and in 2030 to approximately 67 million (Ministry of Tourism and Sports, 2015). As for Thailand's capital, Bangkok, it was chosen as the best tourist destination in Asia-Pacific in 2015 by Master Card's Asia Pacific Destinations Index 2015 (Master Card) (National Tourism Policy Board, 2017) and the destination with a large number of hotel establishments and tourists for visits and overnight stays. Between 2011-2014, Bangkok Metropolitan Area was ranked first in terms of most foreign tourists with 18,580,855 tourists, Phuket was ranked second with 8,395,921 tourists, and Chonburi

was ranked third with 7,216,105 tourists (Ministry of Tourism and Sports, 2015). The growth of the tourism industry has resulted in more income for other businesses from tourists as follows: Lodging facilities were ranked first, goods and souvenirs ranked second, and food and beverages ranked third (Thailand Tourism Intelligence Center, 2018).

At present, the hotel business is experiencing continual growth in parallel with the tourism industry. It is well known that hotel business operation is one of the service businesses that consumes a huge volume of water, from services, accommodations, and other internal activities such as kitchens, laundry rooms, meeting room, seminars, swimming pools, saunas, fitness centers, and spas. Water management for sustainability is important to hotel business operation. The water footprint of hotel businesses is therefore one of the environmental tools to help entrepreneurs efficiently plan their water management. Water footprint is derived from the concept of Mathis Wackernagel and William Rees of British Columbia University, Canada. They gave the definition of Ecological Footprint which serves to assess the demand upon the ecosystem in relation to the global population. This concept was developed into Carbon Footprint and later into Water Footprint (National Food Institute Thailand, 2014)

The agency at the international level responsible for the water footprint is the Water Footprint Network. It cooperated with the International Tourism Partnership (ITP), the agency charged with the promotion of responsible and sustainable tourism, to create a tool to assess the amount of water used in hotel business known as the Hotel Water Measurement Initiative (HWMI) in order for hotels to apply for their water footprint assessment (The International Tourism Partnership (ITP), 2016b). The results of this water footprint assessment show the volume of water used by one hotel guest per one night and one hotel room per one night.

A review of the research related to water footprint assessment revealed that studies had been conducted into agriculture and industry type plants. However, the researcher was interested in studying the water footprint assessment of hotel business, due to the growth of the tourism-related economy. The 20-Year National Strategy (2018-2037) was formulated by the government for national development under the

concept of Thailand 4.0 based on security, prosperity, and sustainability. It promoted tourism as one of the target industries to drive the economy into the future. One of the national strategies on the environment was Strategy 5: Creation of growth based on environmentally-friendly quality of life. The 20-Year National Strategy, the country's master plan, was therefore the framework to define the 12th National Economic and Social Development Plan (2017-2021) in accordance with the 20-Year National Strategy aiming to develop the potential of the tourism business and services for robust growth, promoting green tourism, and increasing efficiency of water management both in terms of quantity and quality. Realizing the importance of both water resource and growth of the tourism industry, the researcher therefore studied the water footprint assessment of hotels type 1 in Bangkok.

Hotels type 1 were scattered around the capital, including inner, mid, and outer areas. There were in total 93 hotels type 1 (Department of Provincial Administration, 2018) and the hotels provided only room services. According to the review of the relevant water consumption data, guest rooms use the highest quantity of water in comparison to other areas within the hotel. Therefore, the researcher has investigated the hotel type1 because the researcher wishes to focus only on guest room water consumption – not other activities – in order to assess the true volume of the water footprint due to guest room consumption. The findings of the study of the water footprint assessment would reveal the volume of water used by one hotel guest per one night which would benefit entrepreneurs in water management to reduce the amount of water used and help them to plan the use of water for maximum benefit. It would also create a good image for the hotels and prepare them to cater to the trend toward environmentally-friendly hotels.

1.2 Objectives of the Study

1.2.1 Assess the water footprint of hotels type 1 in Bangkok

1.2.2 Study water management of hotels type 1 in Bangkok

1.2.3 Recommend a guideline of water management for hotels type 1 in Bangkok

1.3 Scope of Study

This study was to investigate of hotels type 1 according to the ministerial notification determining types and criteria of hotel business operation B.E. 2551 (2008) in Bangkok.

This study concentrated on water footprint assessment by calculating water footprint of hotels type 1, in accordance with HWMI Methodology. The study findings would reveal the volume of water consumption of one hotel guest per one night with the unit of cubic meter/person/day and focus on the awareness of water resource preservation, economical use of water, and maximum benefit, as well as synthesize a guideline of water management from the environmentally-friendly awarded hotels to apply to hotels of other types of hotels. Key informants of this study included hotel executives and employees in hotels type 1 in Bangkok and the study was carried out from January 2018-October 2019.

1.4 Expected Benefits

1.4.1 Acquire water footprint of hotels type 1 in Bangkok.

1.4.2 Acquire the water management of hotels type 1 in Bangkok.

1.4.3 Acquire a guideline of water management for hotels type 1 able to be applied to other types of hotels and other service businesses.

1.4.4 Acquire the HWMI Methodology suitable for hotels type 1 in Bangkok.

1.5 Definition

1.5.1 Water footprint means the volume of consumption of water of one hotel guest/one night in hotel type 1 with the unit of cubic meter/person/night.

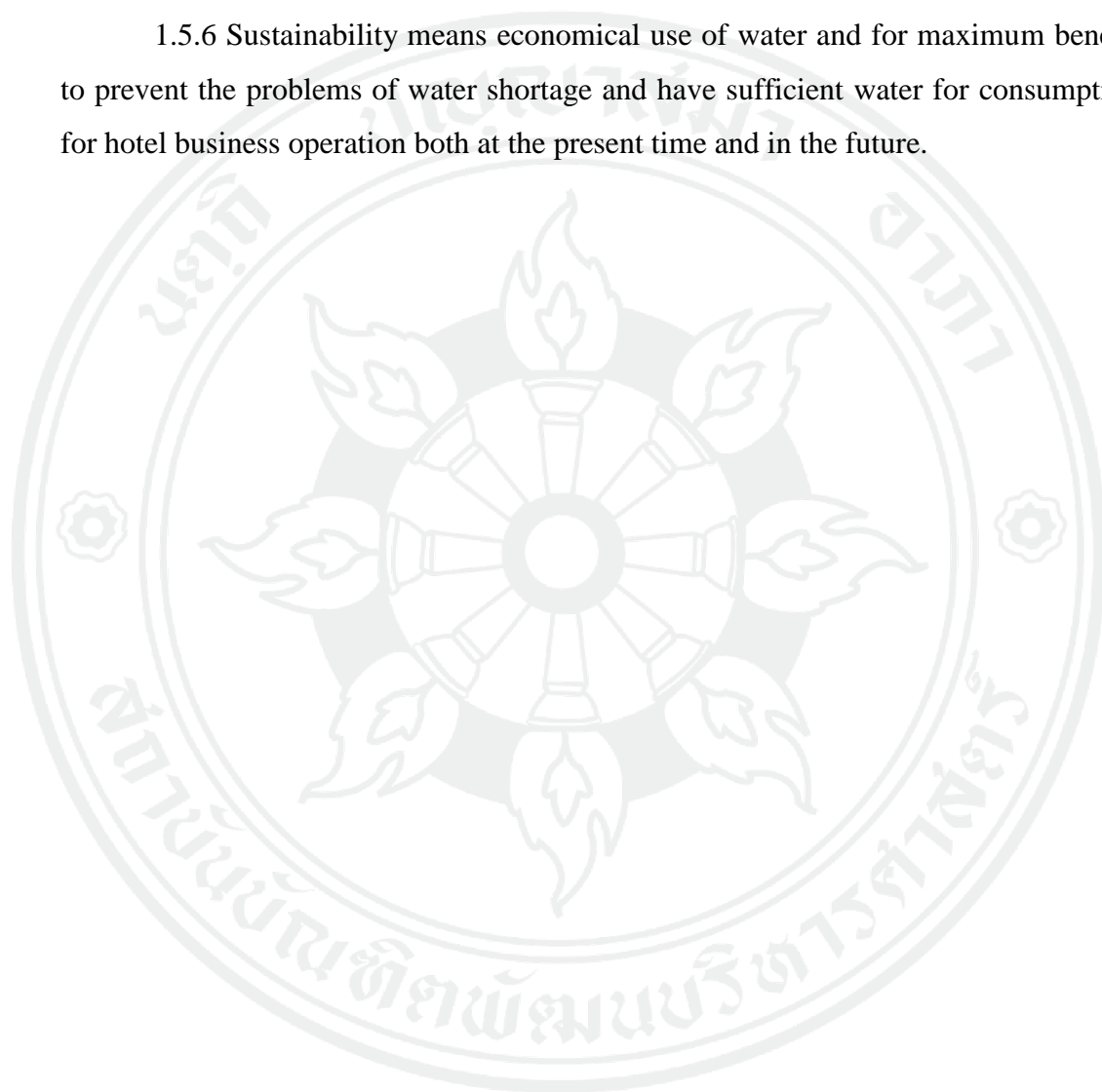
1.5.2 Water footprint assessment means calculation of water footprint of hotels type 1 based on HWMI Methodology 2016.

1.5.3 Hotel type 1 means hotel that provides services of rooms only according to the ministerial notification determining types and criteria of hotel business operation B.E. 2551 (2008).

1.5.4 Guideline means water management of hotels type 1 in Bangkok derived from this study to serve as a guideline for implementation by similar hotels or be adapted as found appropriate by the user.

1.5.5 Water management means planning and determining of implementation of the economical use of water and for maximum benefit in hotels type 1.

1.5.6 Sustainability means economical use of water and for maximum benefit to prevent the problems of water shortage and have sufficient water for consumption for hotel business operation both at the present time and in the future.



CHAPTER 2

RELEVANT THEORIES AND RESEARCH WORKS

The study of the water footprint assessment of hotels type 1 in Bangkok conducted review, and analysis of relevant information, concepts, theories, documents, and research works as follows:

- 2.1 Water footprint and ISO 14046: 2015
- 2.2 Techniques of organizational management
- 2.3 Water management
- 2.4 Hotels
- 2.5 Relevant policies, laws, and measures
- 2.6 Relevant research works

2.1 Water Footprint and ISO 14046:2015

Water footprint measures the water usage of producers or consumers and means the amount of water directly or indirectly used in production process of products and services by calculating the total amount of water of every process in the supply chain of the production of products and services (Yoosabai, 2011) as shown in Figure 2.1.

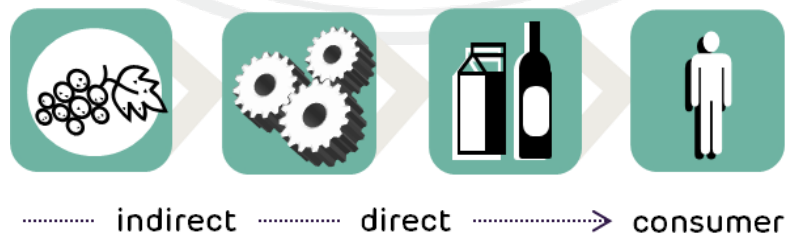


Figure 2.1 Water Usage of the Entire Product Process

Source: Water Footprint Network (n.d.)

This concept was derived from Professors Mathis Wackernagel and William Rees of University of British Columbia, Canada. In their book “Our Ecological Footprint: Reducing Human Impact on the Earth”, they gave the definition of “Ecological Footprint” as the assessment of the demand of eco system per global population to meet the demand of consumption, including land, energy, water, and carbon dioxide. It was developed into Carbon Footprint in 2000 and later into Water Footprint in 2002 by Professor Arjen Hoekstra from the Netherlands (National Food Institute Thailand, 2014). Water footprint was divided into consumer water footprint, country water footprint, watershed water footprint, and business water footprint (Hoekstra & Mekonnen, 2012)

The current water footprint assessment was conducted in line with the Water Footprint Assessment Manual 2011 by Professor Arjen Hoekstra who initiated the concept of water footprint with different calculations according to each type. Relevant water sources needed to be considered namely blue water (underground water sources), green water (surface water used in production of products and services) was water in the form of humidity in the soil used in the production of products and services, and grey water (wastewater used in the production of products and services) (Kaewchur, 2013; Office of Agricultural Affairs, 2019) The composition of the three types of water namely blue water, green water, and grey water is shown in Figure 2.2.

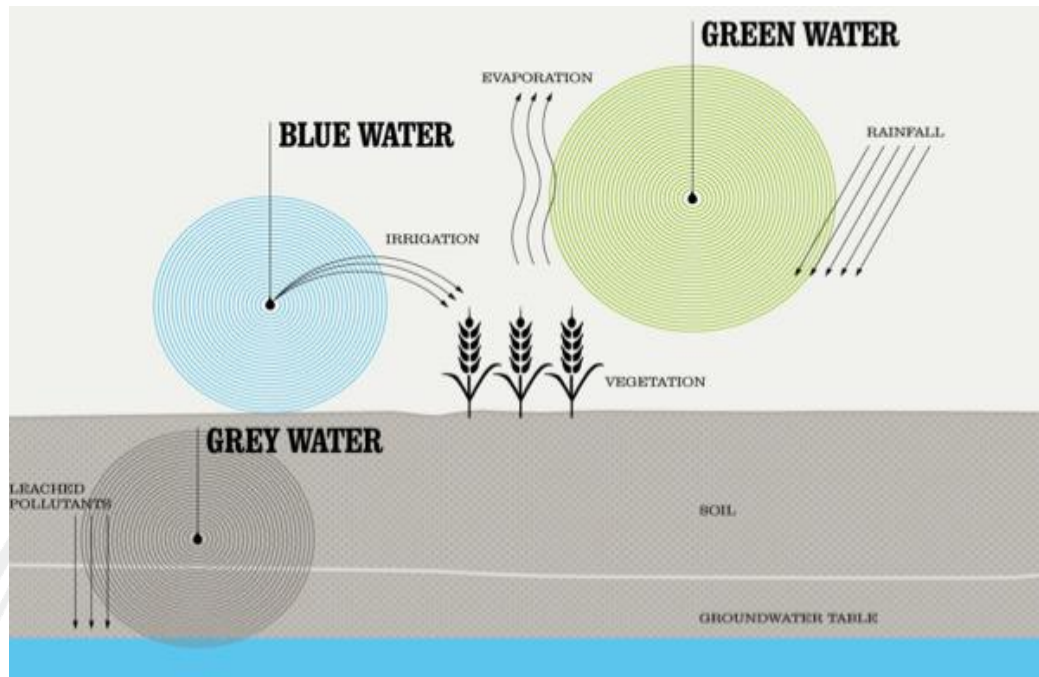


Figure 2.2 Water Usage of the Entire Product Process

Source: Water Footprint Network (n.d.)

The assessment of water footprint of each type is different depending on each study. As this study was the assessment of water footprint of hotels, it was conducted according to the Hotel Water Measurement Initiative (HWMI) Methodology V1.0 September, 2016 which was the tool developed from the Working Group tasked with this initiative companies ITP. The Working Group tasked with this initiative companies ITP and representatives from the following companies; Accor, Carison Rezidor, Diamond Resort, Fairmont Raffles Hotels International, Hilton Worldwide, the Hongkong & Shanghai hotels, Hyatt Hotels Resorts, InterContinental Hotels Group, Las Vegas Sands Corporation, Mandarin Oriental Hotel Group, Marriott International, MGM Hotels & Resorts, NH Hotel Group, Soneva, Starwood Hotels & Resorts, Taj Hotels, Resorts & Palaces, Whitbred, and Wyndham Worldwide. The Working Group is supported by a panel of expert who have been consulted at strategic points of the methodology development such as Alliance for Water Stewardship, Carbon Trust, Earth Check, Ecolab, Responsible Tourism Partnership, Water Footprint Network. The methodology is designed to be applied by any hotel anywhere in the world. The

methodology has been designed in partnership with major group; however, it applies to individual hotels, large and small, regardless of the type of amenities offered.

The methodology had developed process from March 2015 formation of Working Group. April 2015-March 2016 developed of methodology. April-May 2016 road testing with 40 hotels in 19 countries. June-July 2016 refinement of methodology. August 2016 public launch of HWMI. HWMI is a methodology to calculate the amount of water used per occupied room (and per guest night, where data are available) and per area of meeting space per hour. This methodology was developed by International Tourism Partnership (ITP) and its Working Group. (The International Tourism Partnership (ITP), 2016a)

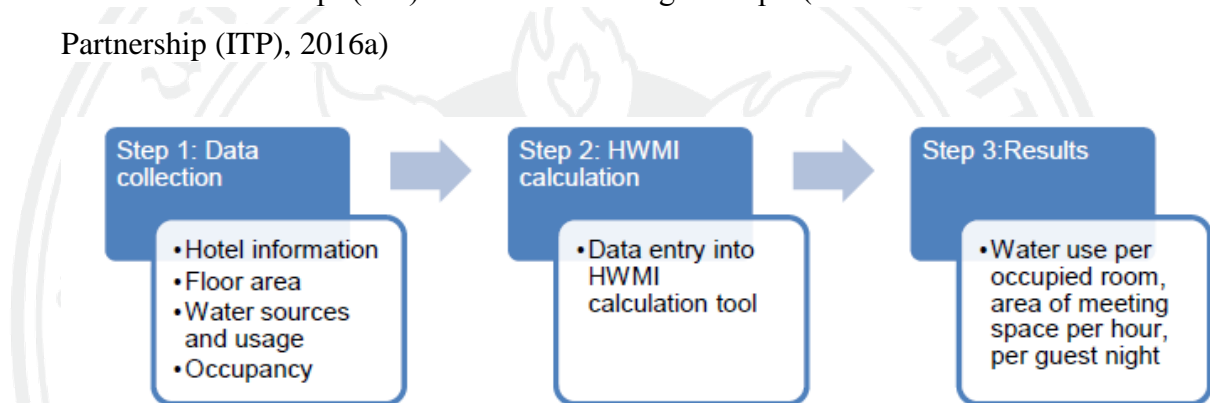


Figure 2.3 Overview of Methodology

Source: The International Tourism Partnership (ITP) (2016a)

In Figure 2.3 in Step 1, Water sources and usage, data requirements are metered water, unmetered municipal water, delivered water, district chilled water, on-site wastewater treatment, outsourced laundry, unmetered ground and surface water, private space.

The total water used by the hotel was shown and divided into three parts namely 1/3 was Guest room use, and 2/3 was All other use including guest rooms floor space and meeting room floor space as shown in Figure 2.4.

Total water use
(including outsourced laundry and unmetered sources, where relevant)

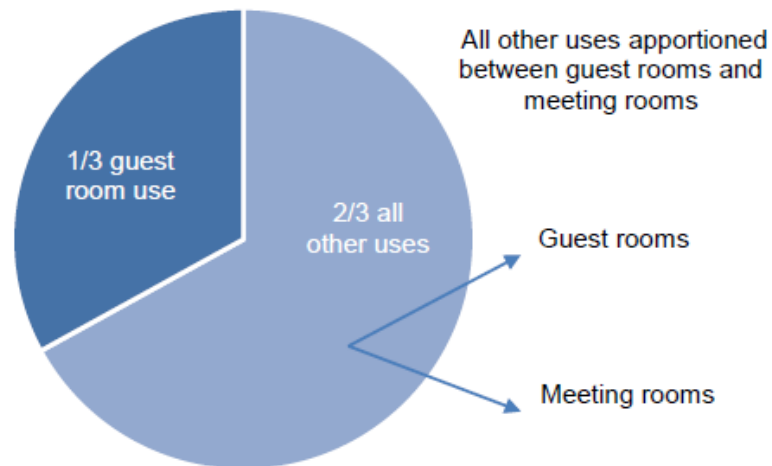


Figure 2.4 Apportionment between Guest Room Use and All Other Uses

Source: The International Tourism Partnership (ITP) (2016a)

The apportionment led to Step 2 HWMI Calculation

Equation 1 Total guest room use:

$$\left(\frac{C}{(X + Y)X} \right) + B = D$$

Total water usage (A) was divided into 3 parts namely 1/3 was Guest room use (B) and 2/3 was All other uses (C) which was sub-divided into guest rooms floor space (X) and meeting room floor space (Y) and obtained total guest rooms use (D) as shown in Figure

2.5

Where: X = guest room floor space; Y = meeting room floor space; A = Total water footprint room use (i.e. 1/3); C = All other uses (i.e. 2/3); and D = Total guest room use.

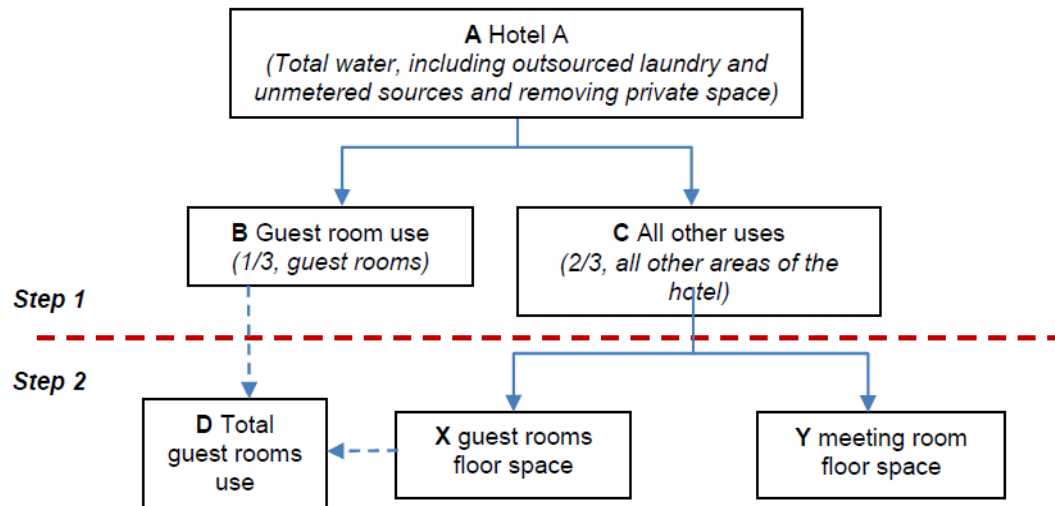


Figure 2.5 Water withdrawal apportionment

Source: The International Tourism Partnership (ITP) (2016a)

Afterwards, Total guest rooms use (D) was calculated to find Total per guest (per night) with the following equation: Total per guest (per night) = Total guest rooms use / Total number of guests (per year). Resulted in the amount of water use per guest/per night in cubic meter.

The result of the water footprint assessment would enable hotel operators to know the amount of water used by one guest per night and enable them to find means to reduce water consumption to reduce hotels' costs and enhance hotels' good image. It reflected hotels' corporate social responsibilities and readiness to meet the trend of environmental-friendly hotels. The products or services showing water footprint would have higher value-added in the future according to the international standards ISO 14046:2015 Environmental management water footprint principles, requirements, and guidelines which served as the guideline of conducting water footprint by calculating the volume of water used in the production process of products and services based on Life Cycle Assessment (LCA). The structure of ISO 14046 consisted of the following:

1) Scope

2) Normative Reference

3) Terms and Definitions

4) Principles consisted of life cycle, importance of environment, compliant operation and responsible agencies, communication, transparency, relevance, completeness, non-conflict, integrity, priority of scientific methods, geography, and competitiveness

5) Operation framework consisted of general regulations, determination of goals and scope, analysis of water footprint account, assessment of impact of water footprint

6) Report on results consisted of general rules, additional rules and guideline of report by the third party, and comparison between diagnosis and study

7) Critical review consisted of demand of critical review, critical review by internal or external experts, and critical review by committees and stakeholders

The benefit of water footprint assessment was to assess the potential water-related impact and preventive guideline to reduce impact on production process or within organization in view of appropriate water management. Water footprint was the information that could be concretely measured in terms of volume, proved, and reliable. Water footprint assessment would enable an organization to know the volume of water used in each activity, by analyzing the obtained information to plan economical and appropriate use of water, supporting the organization's sustainable operation. In the future, it would immune the organization's products and services against trade barrier by using water footprint label as a tool against import barrier (The International Organization for Standardization, 2014).

2.2 Techniques of Organizational Management

Organizational management was crucial to develop and lead the organization towards the defined goals. The theory of organizational management consisted of many concepts. This study chose PESTLE Analysis for analysis of external factors and Mckinsey 7S Model for analysis of internal factors.

2.2.1 PEST Analysis was the guideline of analysis of uncontrollable external factors impacting business operation. It showed how the environment of each factor affected the organization, both positively and negatively, as well as the overview of current environment. It consisted of the following:

P – Politic: political factors such as policy, regulations, or rules of the public sector that would yield both positive and negative impact

E – Economic: economic factors such as rate of economic growth

S – Social: social factors such as attitude, value, belief, social trends

T – Technology: technological factors such as equipment, technology, innovation benefitting the organization with comparative advantage or making differences or reducing costs

E – Environment: environmental factors such as climate, pollution

L – Legal: legal factors such as law, measures, rules, and regulations which were practices, prohibitions, and restrictions as in Table 2.1 (Eiamsri, 2011; Petchjatuporn, 2019).

Table 2.1 Explanation of Environmental Factors

P Political	E Economic	S Social	T Technology	E Environmental	L Legal
<ul style="list-style-type: none"> ▪ Government policy ▪ Political stability or instability overseas ▪ Foreign trade policy ▪ Tax policy ▪ Labor laws ▪ Terrorism and military considerations ▪ Environmental laws ▪ Funding grants and initiatives ▪ Trade restrictions ▪ Fiscal policy 	<ul style="list-style-type: none"> ▪ Economic Growth ▪ Interest Rates ▪ Exchange rates ▪ Inflation ▪ Disposable income of consumers ▪ Disposable income of businesses ▪ Taxation ▪ Interstate taxes ▪ Wages rates ▪ Financing capabilities 	<ul style="list-style-type: none"> ▪ Population growth ▪ Age distribution ▪ Health consciousness ▪ Career attitudes ▪ Customer buying trends ▪ Cultural trends ▪ Demographics ▪ Industrial reviews and consumer confidence ▪ Organisational image 	<ul style="list-style-type: none"> ▪ Producing goods and services ▪ Emerging technologies ▪ Maturity of technologies ▪ Distributing goods and services ▪ Communicating with target markets ▪ Potential Copyright infringements ▪ Increased training to use innovation ▪ Potential Return on Investment (ROI) 	<ul style="list-style-type: none"> ▪ The decline of raw materials ▪ Pollution and green house gas emissions ▪ Promoting positive business ethics and sustainability ▪ Reduction of their carbon foot print. ▪ Climate and weather ▪ Environmental Legislation ▪ Geographical location (and accessibility) 	<ul style="list-style-type: none"> ▪ Health & Safety ▪ Equal Opportunities ▪ Advertising Standards ▪ Consumer Rights and laws ▪ Product Labeling ▪ Product Safety ▪ Safety Standards ▪ Labor Laws ▪ Future Legislation ▪ Competitive Legislation

Source: Andrew (2018)

The analysis of external factors showed the overview of the current factors leading to strategic planning, organizational management restructuring, leading to success. The benefits of the analysis of external factors could be explained with PESTEL as follows: (Andrew, 2018)

- 1) Help to understand and provide insight into the business environment
- 2) Encourage strategic thinking and promote innovation
- 3) Reduce risk when introducing new strategies
- 4) Reduce the effects of future threats to the organization
- 5) Open new opportunities

Therefore, the researchers applied PESTEL to the study to know which external factors would promote and if there still lacked any factors impacting the use of water footprint assessment for hotels type 1 in Bangkok.

2.2.2 Mckinsey 7S Model was the concept initiated by McKinsey, a US consulting firm, since 1980. The McKinsey 7S Model was the analysis of internal organizational management to know the relationship of factors, strengths and weaknesses of internal environment, leading to planning, as well as internal organizational management restructuring, leading to the goals of the organization's success. It consisted of seven factors namely 1) Strategy 2) Structure 3) Systems 4) Style 5) Staff 6) Skills and 7) Shared values (Sittichai & Pooripakdee, 2018) as in Figure 2.6

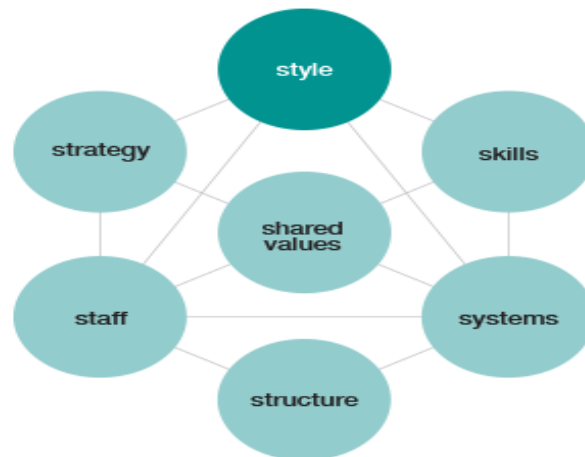


Figure 2.6 McKinsey 7s Framework

Source: McKinsey Quarterly (2008)

1) Strategy is a plan developed by a firm to achieve sustained competitive advantage and successfully compete in the market. What does a well-aligned strategy mean in 7s McKinsey model? In general, a sound strategy is the one that is clearly articulated, is long-term, helps to achieve competitive advantage and is reinforced by strong vision, mission and values. But it is hard to tell if such strategy is well-aligned with other elements when analyzed alone. So, the key in 7s model is not to look at your company to find the great strategy, structure, systems etc. but to look if it is aligned with other elements. For example, short-term strategy is usually a poor choice for a company but if it is aligned with other 6 elements, then it may provide strong results.

2) Structure represents the way business divisions and units are organized and includes the information of who is accountable to whom. In other words, structure is the organizational chart of the firm. It is also one of the most visible and easy to change elements of the framework.

3) Systems are the processes and procedures of the company, which reveal business' daily activities and how decisions are made. Systems are the area of the firm that determines how business is done and it should be the main focus for managers during organizational change.

4) Skills are the abilities that firm's employees perform very well. They also include capabilities and competences. During organizational change, the question often arises of what skills the company will really need to reinforce its new strategy or new structure.

5) Staff element is concerned with what type and how many employees an organization will need and how they will be recruited, trained, motivated and rewarded.

6) Style represents the way the company is managed by top-level managers, how they interact, what actions do they take and their symbolic value. In other words, it is the management style of company's leaders.

7) Shared Values are at the core of McKinsey 7s model. They are the norms and standards that guide employee behavior and company actions and thus, are the foundation of every organization. (Ovidijus, 2013)

This study applied McKinsey 7S Model to its appropriate use by defining the study issues of each factor as follows:

- 1) Strategy policy on water preservation which was part of hotel's environmental and main policies
- 2) Structure/ skills/ staff mean duty, knowledge, and cooperation from employees in performing work in accordance with policies or action plans on water preservation
- 3) System means technology, equipment, and activities on water preservation
- 4) Style means management, communication, monitoring of employees' operation, and equipment using water in hotels.
- 5) Shared values mean awareness and conscience in water preservation

2.3 Water Resource Management

Water is a crucial natural resource for the living. The problems of floods, drought, and water-related pollution all affect living creatures, the economy, and the environment. Therefore, water management with no shortage is very important.

H.M. the late King Bhumibol Adulyadej had concern for his people and placed great importance on solutions to water problems as a major foundation for livelihood and occupation to the farmers who constituted the majority of people in the land. As H.M. the late King Bhumibol Adulyadej said on March 17, 1986 at Chitralada Royal Villa that “the main thing is that there must be water for consumption, for agriculture. Because life is there. If there is water, people can live. If there is no water, people cannot live. Without electricity, people can live. With electricity but without water, people cannot live”. On another occasion of his birthday, H.M. the late King Bhumibol Adulyadej said in front of the congregation on December 4, 1993 at Dusidalai Hall, Chitralada Royal Villa, that “I have said a long time ago about the method to ensure sufficient and appropriate water resources. The word ‘sufficient’ means sufficiency in consumption, use, including household consumption, and agricultural and industrial uses. There must be sufficient water. If not, everything will be suspended. Everything that we are proud of about Thailand’s progress and prosperity will be suspended. There will never progress without water” (Maiklad, 2014)

Water management means process of water management through provision, development, allocation for various objectives including preservation and rehabilitation of water sources for long-term availability and use, as well as solutions to water resource problems in terms of quantity and quality. Sustainable water management means management that focuses on raising awareness of all sectors in society on the values of water, reasonable use of water to enhance widespread availability of water resource, maximum efficiency, balance of quantity and quality, and development and use must go hand in hand with sustainable preservation and rehabilitation.

The major problems of water resources in Thailand consisted of water shortage, drought, floods, and wastewater. The problem currently faced by Thailand was that the large quantity of rainwater was stored and could only be used in small quantity. Thailand had large dams that could contain 70,400 million cubic meters of water. All year round, water entering dams was only the average of 42,000 million cubic meters whereas the yearly demand of water was over 100,000 million cubic meters. In the future, the trend of water demand would increase over 35 percent. The importance was to create balance between quantity of rainwater, quantity of stored water, and quantity

of water use. The creation of the balance of water resources according to the royal initiative of H.M. the late King Bhumibol Adulyadej that “water is life” and water management “from mountains to the sea” was a model for sustainable water management, including rehabilitation and preservation of upstream forests, the development of three types of forests yielding four benefits, as well as management of drought and flash floods outside irrigated areas. If correct water management guideline was concretely implemented, sustainable balance would be created between water capital and water consumption.

The situations of the quality of water for the past ten years (2005-2014) have continuously deteriorated. According to the investigation of the quality of water in the water sources on the soil surface in 2014, the water sources with good quality constituted 29 percent, fair quality 49 percent, and deteriorated quality 22 percent with Bangkok being the area with the worst quality of water. The most serious problem of polluted water sources derived from communities due to the development and expansion of communities, especially riverine communities, where most wastewater was directly discharged into water sources. The common wastewater treatment system of communities between 2010-2014 was not sufficient for the quantity of wastewater of 10.3 million cubic meters a day generated from communities as the wastewater treatment system could accommodate only 31 percent of wastewater. The area with the most wastewater generated from communities was Bangkok with 2 million cubic meters of wastewater a day. But the current wastewater treatment system in Bangkok could treat only 38 percent of the wastewater generated (Maiklad, 2014; Office of the National Water Resources, 2015)

2.3.1 Water management of public organizations

Realizing the importance of water resources, public organizations in Thailand conducted internal water management by focusing on the optimum use of water, generating least wastewater by using the principles of 3Rs namely Reduce, Reuse, Recycle. The public organizations conducting internal water management included PTT Global Chemical who initiated water management since 2005 by using water based on the principles of 3Rs. In every production process, water was used in the most

economical and efficient way. It reduced the use of water from public sources by installing the system of the reuse of treated wastewater, thus reducing the risk of freshwater shortage.

By using innovation of producing fresh water from sea water in the production process, it reduced the use of water from the same community water sources to avoid competition for water. Direct and indirect use of water were assessed to preserve water in the entire supply chain or water footprint. The goals were set up to reduce 10 percent of the amount of water used per product unit from 2014 compared to 2024. Nestle Thailand devised policy on water resource management by which all plants must reduce the use of water as much as possible in production process and enhance efficient use of water. Quality Coffee Products Co., Ltd., Nestle's instant coffee factory, used the principles of 3 Rs in its water management to reduce loss in the production process, generate the least waste, reuse water from the evaporation of coffee for reboiling, and then reuse treated wastewater to water trees in the factory, and feed it in the cooling tower. Thanks to the present water management, there was Zero Waste Water Discharged (Nestle, n.d.). Unilever Thailand set the goal of water management by reducing by half the use of water related to the consumption of Unilever's products by 2020, through efficient development of water-using products such as Comfort One Rinse, unwashed conditioner, and use of the principles of 3 Rs for water management in production process (Unilever, n.d.).

2.3.2 Water management of three model countries

Thailand, through SCG, the Water Foundation of Thailand under the Royal Patronage of H.M. the King, and Thai Journalists Association, organized Thailand Sustainable Water Management Forum 2016 on June 20, 2016 to raise awareness of the importance of water management towards the sustainable prevention of floods and drought by exchanging experience of water management with three model countries namely Israel, Singapore, and the Netherlands, the countries with the water resource problems due to their geography. Singapore, Israel, and the Netherlands placed great importance on water management to sufficiently provide water in response to the needs of the people and encourage them to recognize the value of water.

The geography of Israel was mainly desert. Dr. Weinberger Gavrial, Director, Institute of Hydrology, Israel, said that water was considered a very valuable resource because it was public asset. It was the government's duty to sufficiently allocate water in response to the needs of its people. For the past 50 years, Israel's water management policy essentially "is how to manage limited water for survival and sustainability". Dr. Weinberger Gavrial spoke about Israel's internal water management as follows:

1) Transporting fresh water from the north to the south of the country by connecting the water network with underground pipes, the distance of approximately 6,500 kms, the amount of water in the entire system of approximately 2,000 million cubic meters, for consumption and power generation, and connected to water-generating sources along the coasts, in the form of spider web to reach all areas.

2) Treated wastewater from treatment plants, both large and at community levels, would be added with water into the desert ground in winter, preventing evaporation, returning water to the soil layers, reusing the water in the irrigation system, and gradually reducing the use of non-polluted water in agriculture. Currently, the wastewater used in agriculture constituted as high as 86 percent.

3) Modify water-saving agricultural practice whereby 70 percent of the country's farmland used drip irrigation and 30 percent sprinkler system. The drip irrigation could distribute over 90 percent of water to field crops compared to pumping system, efficiently reducing competition for water in the agricultural sector.

Singapore was an island with two-thirds marsh. It had only 50 percent of drainage of the entire land in the country so it faced the problems of constant floods during the rainy season and had to import water. Mr. Ridzuan Bib Ismail, Director, Water Sources and Watersheds, the Public Utilities Board (PUB), Singapore said that due to the problems faced by the country, the government devised the policy to retain every drop of rainwater, including used water, to be able to reuse it for more than once. PUB would be responsible for water management of the entire life cycle without any waste.

Realizing the role of water in the country's security, the government made announcement to reduce the purchase of water from abroad and turn to the policy of sustainable water management through three water preservation measures as follows:

1) Determine the mechanism of pricing and higher value added for water such as Water Tariff, and Water Conservation Tax to add to the water bills. If more water was consumed, service costs and taxes would be higher.

2) Determine regulations such as Water Efficiency Labeling Scheme (WELS) on all types of household appliances and equipment.

3) Voluntarily engaging people to find water-saving methods in their community, providing incentives such as rewards for the community with the most economical use of water, as well as funding to operate projects in interested areas.

Mr. Ridzuan, 2016 said that the price of water in Singapore was high and it was taxed so that the public would realize the value of water and use it economically. If the public obtained water easily, they would not realize its importance. As mentioned earlier, Singapore faced the problem of floods because of the lower plains. To solve the problem, the 3-4 formerly natural reservoirs were developed into 17 at present. The largest area around the estuary covered one-sixth of the country (Marina Reservoir) and it was stipulated that the construction of every residence must be according to the flood prevention standards, including specific drainage paths.

Moreover, Singapore introduced the technology of wastewater recycling under the name NEWater by filtering wastewater from households and industries through Microfiltration, Reverse Osmosis, and Ultraviolet Disinfection, obtaining raw water in good quality and reusing it back in the production process and cooling in the industrial sector. The rest would be combined with raw water sources to produce tap water for the public. The desalination system was set up. A large factory in the area of the dam around the estuary was constructed side by side with an incinerator to use the energy from incineration in the desalination factory. The strategy of supplying this water source would reduce the problems of conflict of competition for water sources between the industrial sector and the public.

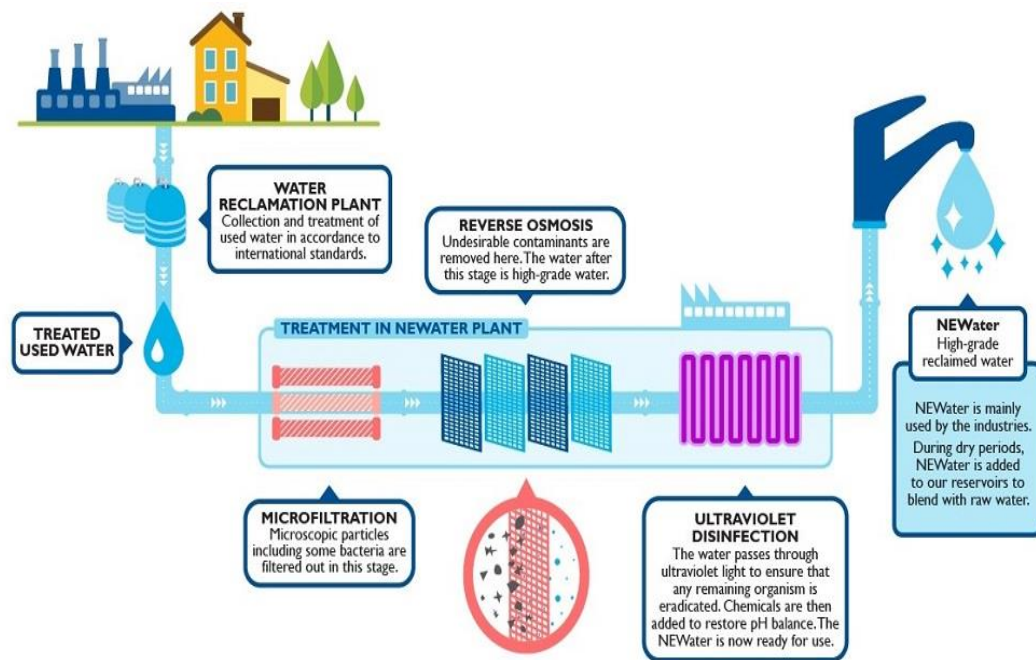


Figure 2.7 Model of Water Recycling, Singapore

Source: The Public Utilities Board (n.d.-b)

The geography of the Netherlands was mostly plains and one-quarter of the country was lower than the sea level, causing frequent floods and damaging the economy valued billions of Euro.

Mr. Tjitte A Nauta a representative of Deltares, a non-profit organization, responsible for water in the Netherlands, said that since 1917 the Netherlands started to solve the problem by constructing reservoirs and lakes in the middle of the country. But in 1953, there was the problem of cracked reservoir. So, the country started the management system of turning on and off water which helped solve the problem. But in 1995, although water mass from the ocean could be prevented, the Rhine River overflowed and caused great damage again. The country learned not to construct or manage water that was against nature. Therefore, it studied waves and let nature protect the country. Apart from management by pumping water out of lakes, constructing many reservoirs, drainage, and pumping stations to prevent half of the country's areas from floods, balance was created between salt and fresh water, as well as underground water. To allow water management to cover everything, to the point, and keep pace with situations, a model of flooding was constructed. Every possible choice was

recommended to solve the problem in order to choose an alternative that would save the budget, to be worthwhile, and most appropriate for use. The model would make us ready. The system could calculate the time that one had to deal with when the reservoir cracked, or which road could still be used. Moreover, it could be used to define the city plan so that it could retain water when there was heavy rain and use modifiable buildings such as floatable houses.

The important thing that the Netherlands was doing at present was to plan for the future, not for only 10 years but 100 years. When Mr. Tjitte A Nauta came to assist Thailand during the great floods of 2011, he realized that Thailand should make long-term planning. The guideline that the Netherlands used could be adapted in the case of Thailand. But it would need integrated cooperation from all parties, with flexibility, not against nature, and use of technology to plan for the most appropriate and worthwhile alternative (Hydro informatics Institute, 2016).

Water management in each country was different according to its geography and nature of problems. But the common goal of water management of each country was water for sustainable use. From the examples of the three model countries namely Israel, Singapore, and the Netherlands, the government sector, overseeing the country's administration, conducted water management for people in the country to have water for consumption. Water management required cooperation of all parties involved, including cooperation of the public who were water users and who needed to realize the value of water resource leading to sustainability.

2.3.3 Water management in hotel business

The tourism industry is an industry that uses a large quantity of water to accommodate comfort and convenience of tourists. Therefore, management to ensure sufficient water, without water shortage, is a very important issue to enable the tourism industry to grow. Hotel business which mainly offers services in overnight accommodations, good water management will greatly contribute to water preservation and enhance good image of hotel business operators. For example, Novotel Bangkok Siam Square Hotel, which was awarded the Green Leaf hotel standard, conducted water

management by adhering to preservation principles of optimum use of resources, stating clear policy and objectives, placing posters for the acknowledgement and participation of employees at all levels. The hotel conducted economical use of water by engaging employees at all levels to be knowledgeable and conscious of environmental protection, by placing posters encouraging the economical use of water and energy at various spots, recording, investigating, and analyzing for improvement. Implementation included installation of water gauge, both hot and cold water, at various spots to know the amount of water used, to inspect daily, monthly, and yearly use of water, installation of water-saving toilet that could reduce water consumption by half, installation of automatic system for turning on-off water in urinals and washbasins, campaign to engage hotel guests to participate in water-saving activities by placing posters for no washing in the guest rooms to reduce the washing of towels and bed sheets, using ozone washing system that could reduce 40 percent of the use of water, reusing treated water to water trees, filling waterfalls in front of the hotel, etc.



Figure 2.8 Toilet with dual flush system for water-saving use

Source: Trirat, Kieatkulpaiboon, and Petchpirom (2010)



Figure 2.9 Water-saving measures posted on elevator doors

Source: Trirat et al. (2010)



Figure 2.10 Large washing machine using ozone system for water- and chemical – saving washing

Source: Trirat et al. (2010)

2.4 Hotels

Travelling is one factor that generates hotel business. Activities generating various accommodations include tourism, business, sports. Hotels are therefore essential for travelers needing temporary accommodations. The improvement of quality accommodations will contribute to increased income for business operators and the country's economy. As for the global tourism situations, the number of tourists has increased on a continuous basis. According to United Nations World Tourism Organization (UNWTO), since 1990, the number of tourists worldwide has increased on a continuous basis. It is expected that by 2030, the number of tourists will increase to 1,800 million, or the average growth of 3.3 percent a year as in Figure 2.11. Therefore, tourism industry will experience growth and assume an important role in the country's economy. The trend of competition in tourism will intensify in the future. As for the tourism situations in Thailand, it is expected that in 15 years, it will experience continuous growth from 24.7 million tourists in 2014 to the expected 45 million tourists in 2020 and to 67 million tourists in 2030 as in Figure 2.12 (Ministry of Tourism and Sports, 2015).



Figure 2.11 Trend of the number of tourists worldwide in 2030

Source: Ministry of Tourism and Sports (2015)

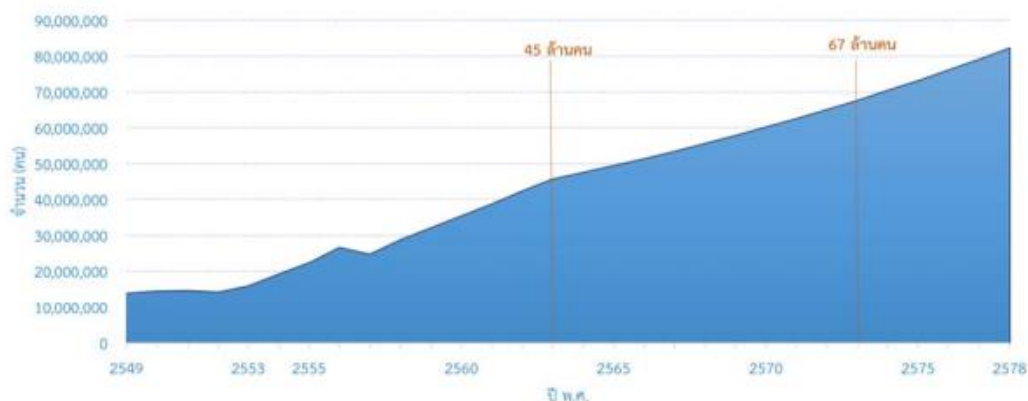


Figure 2.12 Trend of the number of tourists in Thailand between 2006-2035

Source: Ministry of Tourism and Sports (2015)

The meaning of hotel according to the Hotel Act B.E. 2547 (2004)

Hotel means accommodation set up with the objective of business offering services of temporary accommodation for travelers or other persons with charges, but excluding:

1) Accommodation set up to provide services of temporary accommodation operated by the government sector, state enterprise, public organization, or other government agency, or for charity, or education. It is also non-profit, without profit sharing

2) Accommodation set up with the objective of providing services of accommodation by charging monthly fees

3) Other accommodation as stipulated in the Ministerial notification (Office of the Council of State, 2010)

In Thailand, the application for hotel operation permit must be undertaken at Department of Provincial Administration, Ministry of the Interior. The criteria for setting up a hotel are as follows:

- 1) Accommodation building must be reinforced concrete or other secure and strong building.
- 2) Hotel's objective must be to serve as accommodation uniquely for travelers or tourists, without nature or behavior contrary to public order or good morals.
- 3) Location must not be in the radius of 100 meters from a government agency, school, temple, place of worship, or hospital and must be situated in an appropriate and convenient location for inspection. The entrance and exit must not have any traffic problem.
- 4) Parking lot must be sufficient and balanced for the number of guest rooms. Parking lot must be separated from the rooms and there must not be any passage for cars to pass the rooms in each floor.

The process for application to set up a hotel is as follows:

Those who wish to operate hotel business must apply for a permit according to RR1 form to the registrar in the area where the hotel is situated. According to the notification of the Ministry of the Interior on the appointment of a registrar according to the Act of 2004, the registrar includes Director General of Department of Provincial Administration in Bangkok and governors in other provinces. In Bangkok, the operator is to submit the documents to Investigation and Legal Affairs Bureau, Department of Provincial Administration. In other provinces, the operator is to submit the documents to district office or district branch office where the hotel is situated according to the notification of the Ministry of the Interior on the criteria and implementation for the consideration of application for permit and issuance of permit for hotel business operation.

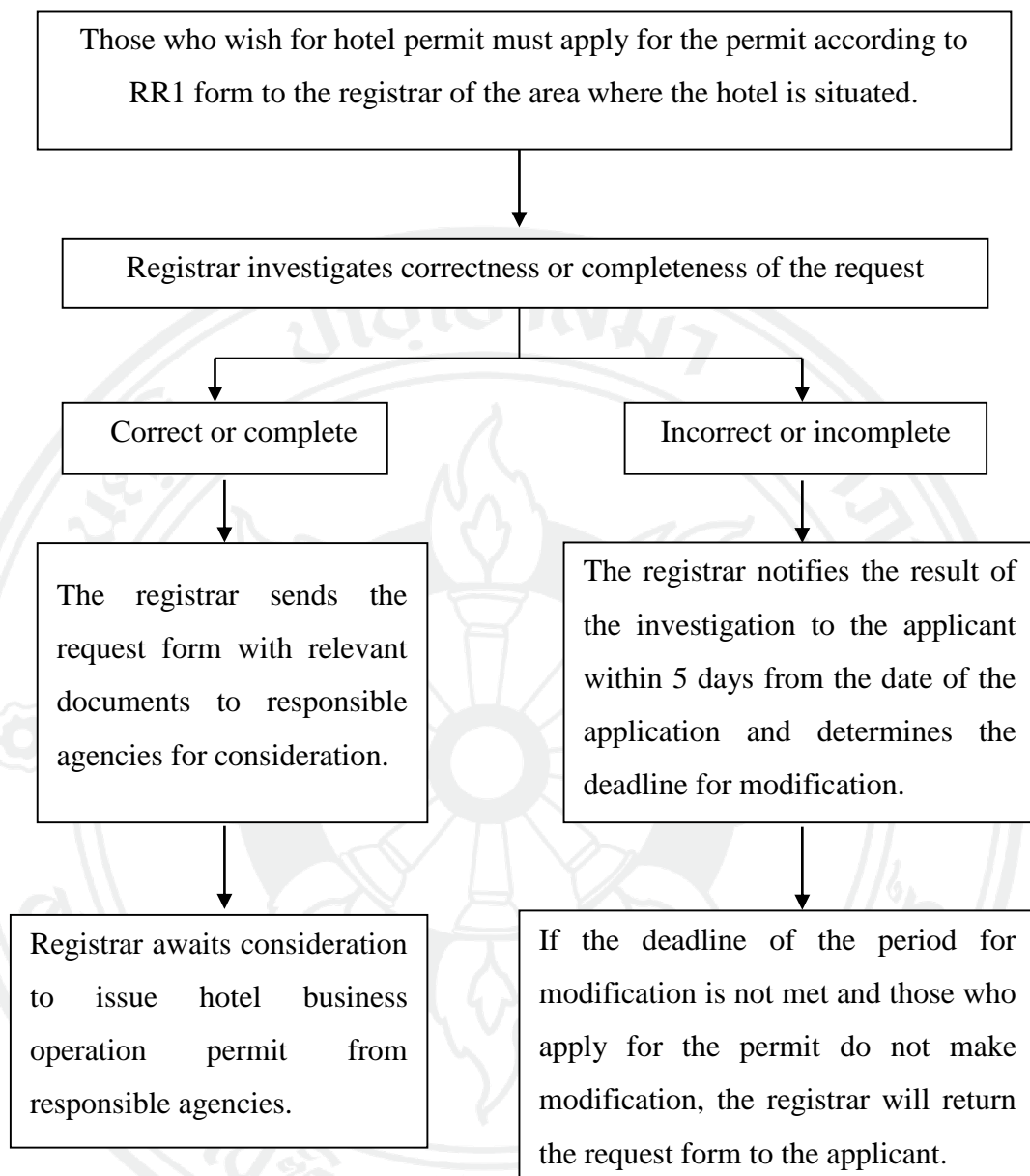


Figure 2.13 Process of Application for Permit and Issuance of Permit to Hotel Business Operation

Source: Ministry of the Interior (n.d.); Office of the Council of State (2010)

In case the registrar considers that it is not suitable to grant a permit, the registrar must notify the applicant in order for the applicant to petition and produce evidence before issuing the order. Once the order is issued, the order and the right of petition must be relayed to the applicant for acknowledgment (Ministry of the Interior, n.d.).

The Ministerial notification determining types and criteria of hotel business operation B.E. 2551 (2008) classified hotels into four types as follows:

- 1) Hotel type 1 means hotel providing services for accommodation only
- 2) Hotel type 2 means hotel providing services of rooms and restaurants, or place offering food, or for food preparation
- 3) Hotel type 3 means hotel providing services of rooms, restaurants, or place offering food, or for food preparation, and establishment offering services according to the law on establishment offering services or meeting/seminar rooms
- 4) Hotel type 4 means hotel providing services of rooms, restaurants, or place offering food, or for food preparation, and establishment offering services according to the law on establishment offering services and meeting/seminar rooms (Ministry of Interior, 2008) as in Figure 2.14.

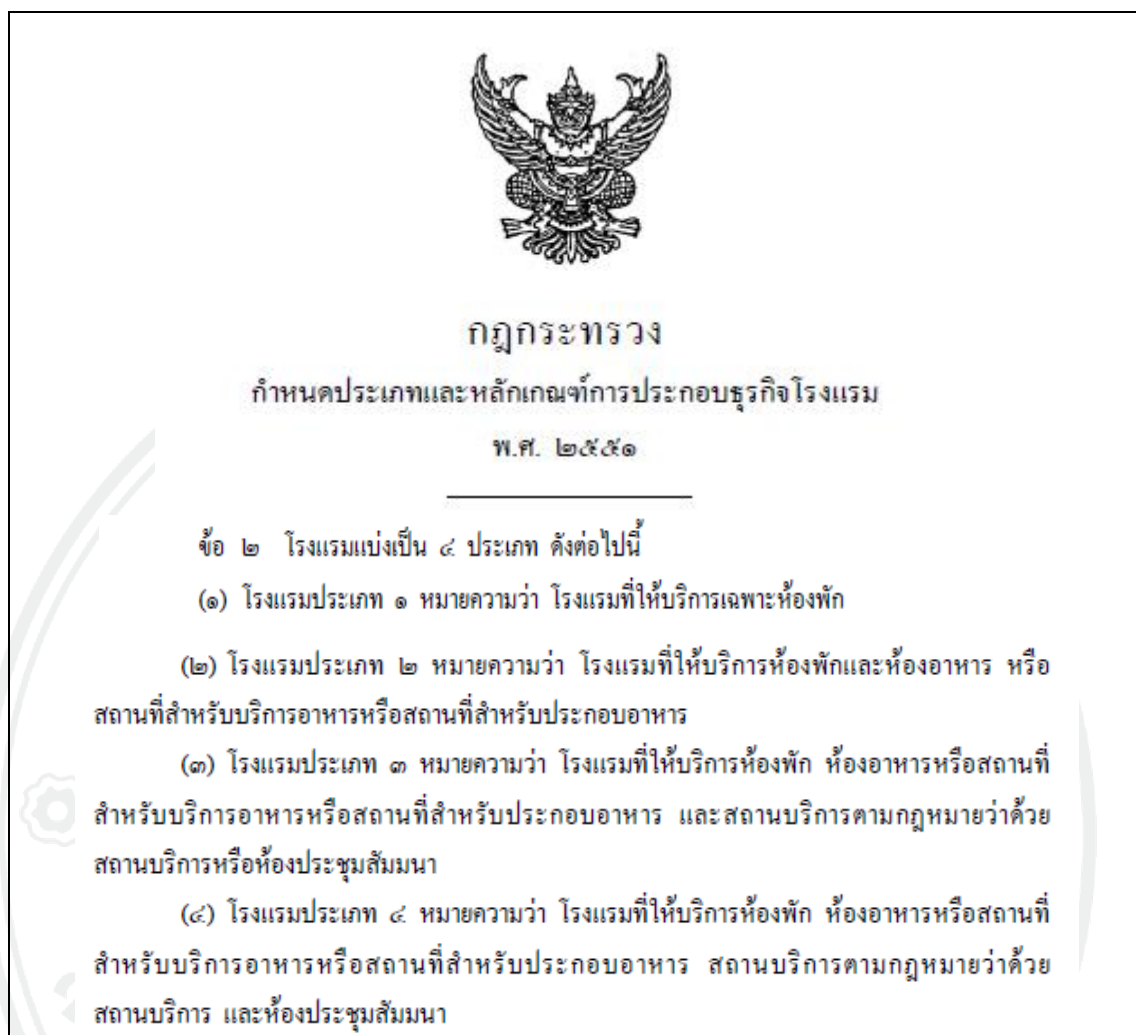


Figure 2.14 Ministerial Notification determining Types and Criteria of Hotel Business Operation B.E. 2551 (2008)

Source: Ministry of Interior (2008)

The standards of accommodations for tourism, divided according to levels into 1-5 stars by Department of Tourism, determined the quality level of services provided in accommodations type hotels and served as alternatives for tourists to choose the service according to the quality levels. The hotels applying for assessment must be in possession of hotel business operation permits according to the Ministerial notification determining types and criteria of hotel business operation B.E. 2551 (2008) (Ministry of Tourism and Sports, 2015) Therefore, the study of water footprint assessment of hotels type 1 in Bangkok chose the samples for the study based on the classification of hotels according to the Ministerial notification determining types and criteria of hotel

business operation B.E. 2551 (2008) which was the lawful regulation of hotel business operation.

Moreover, other accommodations with similar meaning to hotels included the following:

- 1) Inn means small accommodation next to the road, generally without serving food and drinks
- 2) Guest House means house owner's rented accommodation by renting out an area of the house
- 3) Motel means small hotel on main roads
- 4) Resort means accommodation for relaxation, generally situated in lush suburban areas or natural tourist destinations, and suitable in terms of nature, climate, internal activities such as outdoor sports (Soipetch, 2010).

In the past, travelers stopped at hotels for overnight accommodations. Nowadays, hotels no longer provide only overnight accommodations. They offer various activities such as fitness, spa, sauna, and swimming pool. Therefore, hotels also serve as places for relaxation. Hotel's internal environmental management activities for attractive landscape, and environmental implementation such as energy preservation, water preservation, waste management are therefore crucial to attract tourists and protect environment.

Hotel is a place where water is used in large quantity to cater to comfort and convenience of guests. Activities using water include guest rooms, seminars, restrooms, kitchens, restaurants, laundry, swimming pool, fitness, spa, and sauna. If the hotel places importance on water management, good water management will enhance the hotels' good image and reduce water costs and wastewater treatment fees. As at present, Bangkok Metropolitan Administration is prepared to enforce the Act on collecting wastewater fees by determining the rate of wastewater fees according to the three types of building as follows:

1) For households with the volume of wastewater exceeding 10 cubic meters a month but not exceeding 100 cubic meters a month, the rate will be 30 baht per month per household.

2) For government agencies, state enterprises, private sector, foundations, places of religious worship, hospitals, schools, and small business with the volume of wastewater not exceeding 500 cubic meters per month, the rate will be 500 baht per month per household. For the volume of wastewater exceeding 500 cubic meters a month but not exceeding 1,000 cubic meters a month, the rate will be 1,000 baht per month per household. For the volume of wastewater exceeding 1,000 cubic meters a month, the rate will be 1,500 baht per month per household

3) For hotels, factories, and large business, the fees will be calculated according to the volume of real water use or the rate of 4 baht per cubic meter (Finance Office Bangkok Metropolitan Administration, 2016)

As for the specification of standards of wastewater from building, the types of building can be classified into the following:

Buildings is classified into five types as follows:

1) Buildings type A means the following:

(1) Condominiums with the total number of rooms for habitation of all floors in the building or group of building from 500 bedrooms upward

(2) Hotels with the total number of rooms for accommodation of all floors in the building or group of building from 200 rooms upward

(3) Public hospitals or hospitals according to the law on the hospitals with the total floors to accommodate overnight patients in the building or group of building from 30 beds upward

(4) Buildings of private or public schools, private or public higher education institutes with the total space of all floors in the building or group of building from 25,000 square meters upward

(5) Office buildings of government agency, state enterprise, international organization, or private sector with the total space of all floors in the building or group of building from 55,000 square meters upward

(6) Buildings of shopping mall or department store with the total space of all floors in the building or group of building from 25,000 square meters upward

(7) Markets with the total space of all floors in the building or group of building from 2,500 square meters upward

(8) Restaurants with the total service space of all floors in the building or group of building from 2,500 square meters upward

2. Buildings type B mean the following:

(1) Condominiums with the total number of rooms for habitation of all floors in the building or group of building from 100 bedrooms upward but not exceeding 500 bedrooms

(2) Hotels with the total floors for accommodation in the building or group of building from 60 rooms upward but not exceeding 200 rooms

(3) Hostels with the total floors for habitation in the building or group of building from 250 rooms upward

(4) Establishments with the total service space of all floors in the building or group of building from 5,000 square meters upward

(5) Public hospitals or hospitals according to the law on the hospitals with the total floors to accommodate overnight patients in the building or group of building from 10 beds upward but not exceeding 30 beds

(6) Buildings of private school or public schools, private or public higher education institutes with the total space of all floors in the building or group of building from 5,000 square meters upward but not exceeding 25,000 square meters

(7) Office buildings of government agency, state enterprise, international organization, or private sector with the total space of all floors in the building or group of building from 10,000 square meters upward but not exceeding 55,000 square meters

(8) Buildings of shopping mall or department store with the total space of all floors in the building or group of building from 5,000 square meters upward but not exceeding 25,000 square meters

(9) Markets with the total space of all floors in the building or group of building from 1,500 square meters upward but not exceeding 2,500 square meters

(10) Restaurants with the total service space of all floors in the building or group of building from 500 square meters upward but not exceeding 2,500 square meters

3. Buildings type C means the following:

(1) Condominiums with the total number of rooms for habitation of all floors in the building or group of building not exceeding 100 bedrooms

(2) Hotels with the total number of rooms for accommodation of all floors in the building or group of building not exceeding 60 rooms

(3) Hostels with the total number of rooms for habitation of all floors in the building or group of building from 50 rooms but not exceeding 250 rooms

(4) Establishments with total space of all floors in the building or group of building from 1,000 square meters upward but not exceeding 5,000 square meters

(5) Office buildings of government agency, state enterprise, international organization, or private sector with the total space of all floors in the building or group of building from 5,000 square meters upward but not exceeding 10,000 square meters

(6) Markets with the total space of all floors in the building or group of building from 1,000 square meters upward but not exceeding 1,500 square meters

(7) Restaurants or shops with the total service space of all floors in the building or group of building from 250 square meters upward but not exceeding 500 square meters

4. Buildings type D mean the following:

(1) Hostels with the total rooms for habitation of all floors in the building or group of building from 10 rooms upward but not exceeding 50 rooms

(2) Markets with the total space of all floors in the building or group of building from 500 square meters upward but not exceeding 1,000 square meters

(3) Restaurants with the total service space of all floors in the building or group of building from 100 square meters but not exceeding 250 square meters

5. Buildings type E means restaurants with the total service space of all floors not exceeding 100 square meters

The buildings of hotel type can be summarized as the hotels according to the law. With over 200 hotel rooms, the hotel is classified as building type A. Between 60 and not over 200 rooms, the hotel is classified as building type B. With fewer than 60 rooms, the hotel is classified as building type C. As for the standards of control of wastewater discharge from buildings of some types and sizes, the details of water quality index (Pollution Control Department, 2005) are in Table 2.2

Table 2.2 Standards to control the discharge of wastewater from buildings of some types and sizes

Water quality index	Unit	Highest criteria according to the standards of the control of wastewater discharge					Methods of analysis
		A	B	C	D	E	
1. pH	-	5-9	5-9	5-9	5-9	5-9	Use of pH Meter
2. BOD	ppm.	Not Exceeding 20	Not exceeding 30	Not exceeding 40	Not exceeding 50	Not exceeding 200	Use of Azide Modification at the temperature of 20 degrees Celsius for five consecutive days or other methods approved by Pollution Control Committee
3. Volume of solids	ppm.	Not exceeding 30	Not exceeding 40	Not exceeding 50	Not exceeding 50	Not exceeding 60	Filtration through Glass Fibre Filter Disc
- Suspended Solids							
- Settleable Solids	ppm.	Not exceeding 0.5	Not exceeding 0.5	Not exceeding 0.5	Not exceeding 0.5		Use of Imhoff cone containing 1,000 sq. cm. for one hour

Water quality index	Unit	Highest criteria according to the standards of the control of wastewater discharge					Methods of analysis
		A	B	C	D	E	
- Total Dissolved Solid	ppm.	ppm.	Not exceeding 500*	Not exceeding 500*	Not exceeding 500*	Not exceeding 500*	Evaporation at the temperature between 103-105 degrees Celsius for one hour
4. Sulfide	ppm	Not exceeding 1.0	Not exceeding 1.0	Not exceeding 3.0 -	Not exceeding 4.0	-	Titrate method
5. Nitrogen in the form of TKN	ppm.	Not exceeding 35	Not exceeding 35	Not exceeding 40	Not exceeding 40	-	Kjeldahl method
6. Fat, Oil and Grease	ppm.	Not Exceeding 20	Not Exceeding 20	Not exceeding 20	Not exceeding 20	Not exceeding 100	Extraction using solutions and separation to obtain the weight of oil and fat

Source: Pollution Control Department (2005)

2.5 Relevant Policies, Laws, and Measures

This study conducted the review of Thailand's relevant policies, laws, and measures at both international and national levels.

2.5.1 Sustainable Development Goals

The Millennium Development Goals (MDGs) consisted of 8 goals namely Goal 1 Eradicate extreme poverty and hunger, Goal 2 Achieve universal primary education, Goal 3 Promote gender equality and empower women, Goal 4 Reduce child mortality, Goal 5 Improve maternal health, Goal 6 Combat HIV/AIDS, malaria and other diseases, Goal 7 Ensure environmental sustainability, and Goal 8 Develop global partnership for development and ended in 2015. Afterwards, the United Nations devised the Sustainable Development Goals (SDGs) for the duration of 15 years (September 2015-August 2030) to serve as a direction framework for global development. Countries would implement it for sustainable development, including economic, social, and environmental aspects. Together, they would drive sustainable development towards the goals through appropriate application under the context of each country, from policy at national level, projects, activities with 17 sustainable development goals (United Nations Thailand, 2016) as shown in Figure 2.15.

Goal 1 No poverty, Goal 2 Zero hunger, Goal 3 Good health and well-being, Goal 4 Quality education, Goal 5 Gender equality, Goal 6 Clean water and sanitation, Goal 7 Affordable and clean energy, Goal 8 Decent work and economic growth, Goal 9 Industry, innovation, and infrastructure, Goal 10 Reduced inequalities, Goal 11 Sustainable cities and communities, Goal 12 Responsible consumption and production, Goal 13 Climate action, Goal 14 Life below water, Goal 15 Life on land, Goal 16 Peace, justice, and strong institutions, and Goal 17 Partnerships.



Figure 2.15 17 Sustainable Development Goals

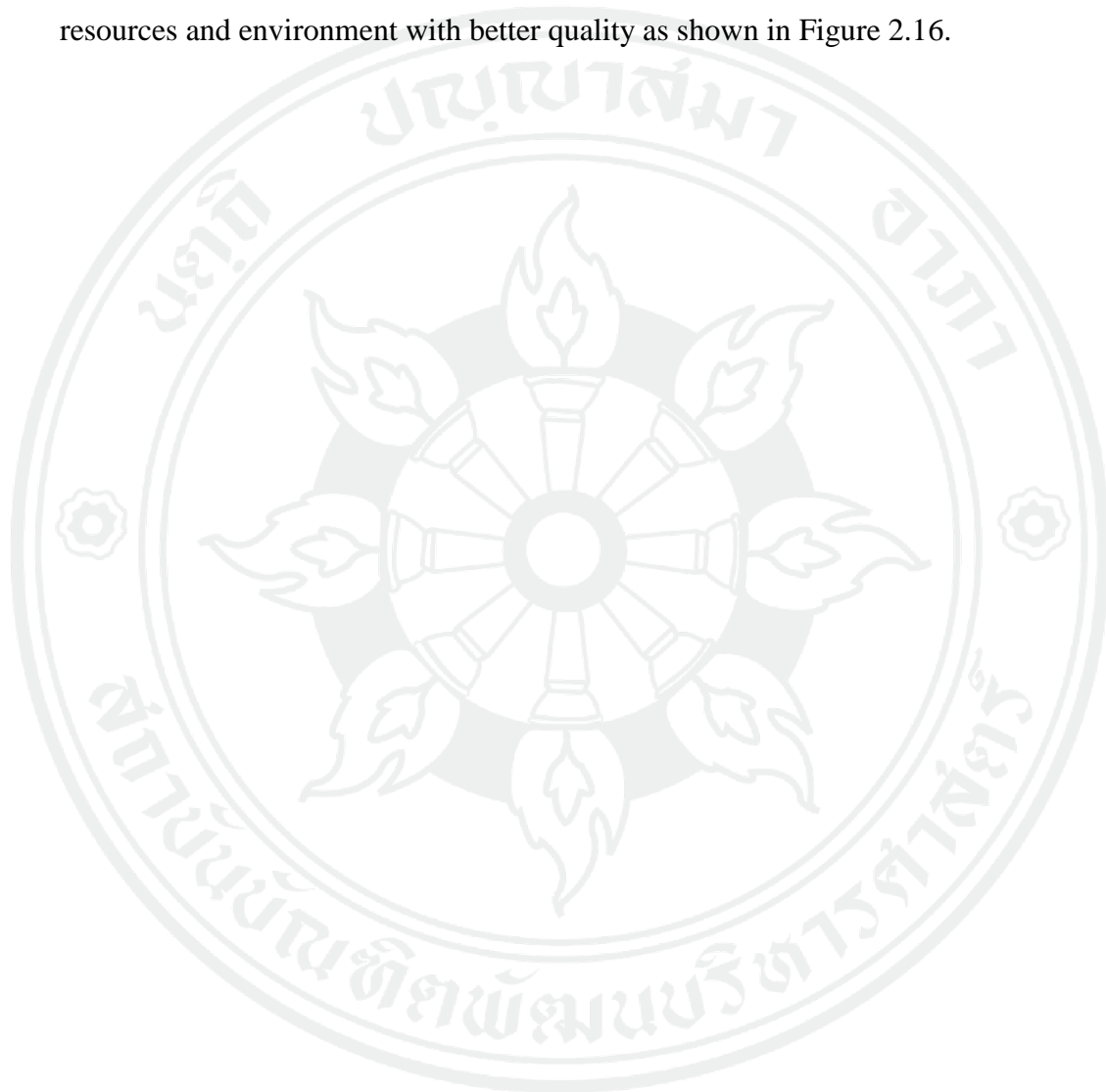
Source: United Nation (2015)

Goal 6 mentioned sustainable clean water and sanitation that water scarcity affected more than 40 percent of global population. Therefore, by 2030, safe and affordable drinking water must be provided for all and efficient use of water must be promoted (Pollution Control Department, 2005; United Nations Thailand, 2016). Thailand complied with the sustainable development goals by which the 12th National Economic and Social Development Plan 2017-2021 devised the increased efficiency of water management to reach security, balance, and sustainability both in quantity and quality.

2.5.2 20-Year National Strategy

The government formulated the 20-Year National Strategy (2018-2037) with the goals of sustainable development and framework to implement various action plans in compliance with the National Strategy in order for Thailand to reach the vision of **“Thailand as a developed country with security, prosperity, and sustainability, based on the Efficiency Economy Philosophy”**. The environmental issue was defined under the security dimension namely security of food, energy, and water. The prosperity dimension included abundance in capital of natural resources and

environment. The sustainability dimension included the principles of use, maintenance, and rehabilitation of sustainable natural resources, non-excessive use of natural resources, without excessively polluting the environment so that the eco system could not be sustained or remedied, environmental-friendly production and consumption, in accordance with sustainable development goals, as well as more abundant natural resources and environment with better quality as shown in Figure 2.16.



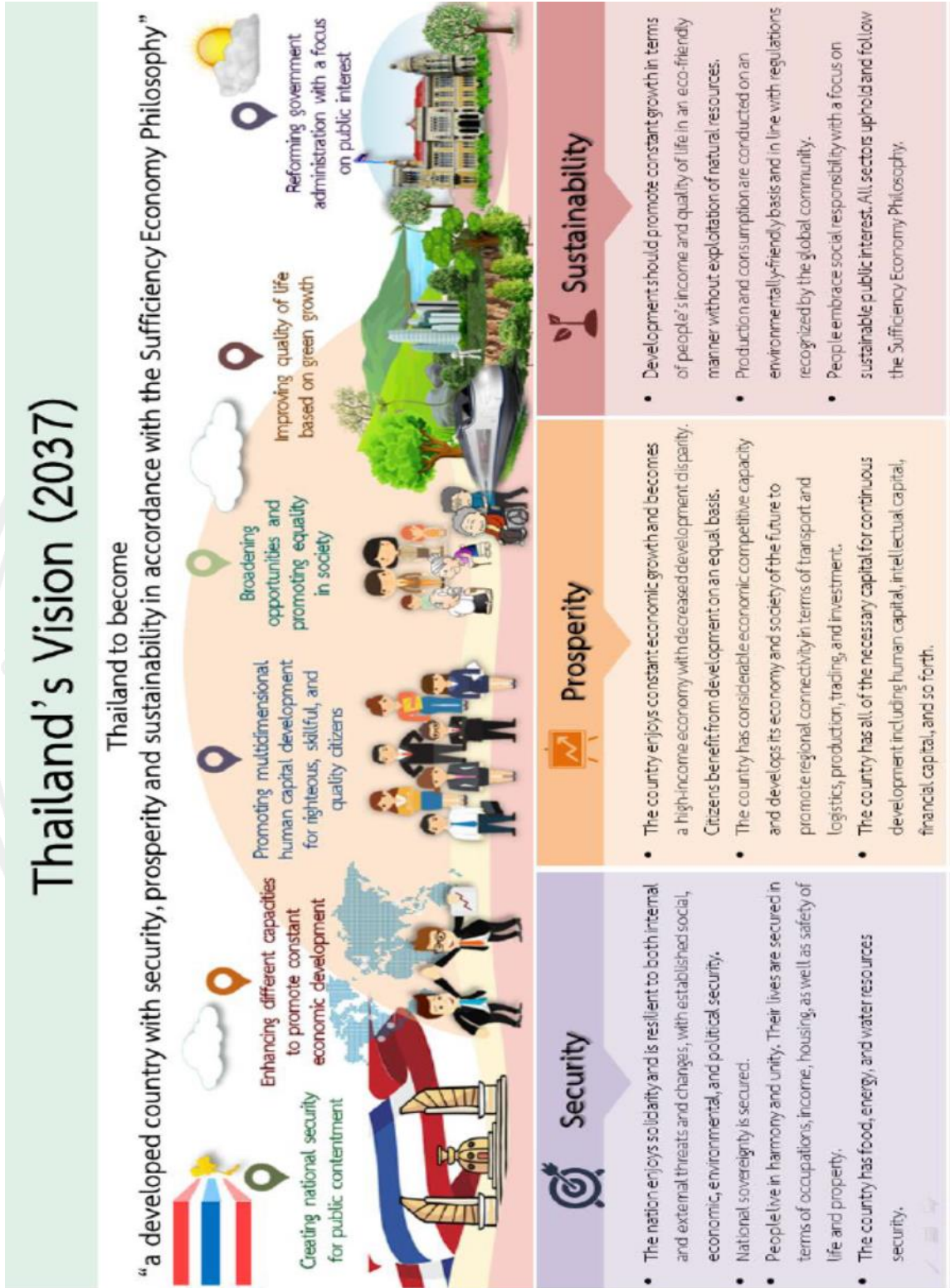


Figure 2.16 Thailand's Vision 2037

Source: National Strategy Secretariat Office (2018)

One of the strategic issues of the National Strategy on environment included Strategic Issue 5: Creation of growth based on environmental-friendly quality of life which stated that “the goal focuses on major development leading to sustainable development goals in all dimensions including social, economic, environmental, good governance, and cooperation partnership through integration, both domestic and international. Area-based strategies and action plans are formulated, and all relevant sectors are directly engaged as much as possible. Work is performed based on common growth including economic, environmental, and quality of life, giving priority to create balance in the three areas leading to real sustainability for the next generation”. It also mentioned water security that “sufficient supply of water is necessary for the growth of cities, for habitation, commerce, and services.”

2.5.3 National Economic and Social Development Plan

Since the 11th National Economic and Social Development Plan, the quality of water was stated as lower than the standards, water sources were contaminated, quality of main rivers was increasingly reduced, fewer water resources that passed the criterial of fair quality to 61.0 percent in 2010 from 74.0 percent in 2006. The next phase would need to accelerate rehabilitation and preservation of lush natural resources, pollution control, and creation of good environmental quality, leading to the country’s solid foundation and for Thais’ sustainable living. The 12th National Economic and Social Development Plan (2017-2021) continued to state the situation of the country’s environmental problems that there was a reduced tendency for the quality of water that passed the criteria of good quality. The situation of the quality of water for the past 10 years (2005-2014) tended to deteriorate by which the water sources that passed the criteria of good quality tended to reduce.

At the same time, the water sources that passed the criteria of fair quality or the water sources that deteriorated tended to increase. The main causes derived from soil erosion with fertilizer residue from agriculture and farming, wastewater discharge from communities, insufficient common community wastewater treatment system following the community expansion and growth. At present, there were 10.3 million cubic meters

a day of community wastewater whereas the wastewater treatment system could treat only 31 percent of wastewater.

The 12th National Economic and Social Development Plan devised the strategies on the environmental-friendly growth for sustainable development. The goal was to enhance green growth based on the 11th National Economic and Social Development Plan. The guideline of major development under the Strategy included the following:

- 1) Maintain natural capital for green growth
- 2) Promote environmental-friendly consumption
- 3) Promote green production, investment, and employment
- 4) Manage pollution and preserve quality of environment
- 5) Develop international cooperation on environment
- 6) Increase ability of adaptation to handle climate change and management to reduce risks of disasters

The policy at the national level placed great importance on the drive towards environmental-friendly growth. Therefore, the strategy formulation in line with the policy is important. The 12th National Economic and Social Development Plan devised national development strategy on development of tourism industry by the following: Development of tourism cluster according to the potential of areas; Connection with tourism business according to the demand of markets such as health-related tourism, sports-related tourism, green tourism; Strategy on environmental-friendly growth by increasing efficiency of water resource management leading to security, balance, and sustainability; Acceleration to control pollution, including air, waste, wastewater, and hazardous waste; Support of design of environmental-friendly production system and innovation of goods and services; Support of issuance of carbon footprint label; Promotion of goods with green label and other environmental labels; and Development of database of life cycle assessment of products leading to formulation of environmental water footprint standards.

2.5.4 Strategy of Thailand's Tourism 2015-2017, Department of Tourism, Ministry of Tourism and Sports

Tourism is an industry that is crucial to the country's economy. The Ministry of Tourism and Sports, directly in charge of tourism, devised the Strategy of Thailand's Tourism 2015-2017 as a driving mechanism of the government's policy. The developing strategy transformed the image of Thailand under the Amazing Thailand brand (Rebranding) from Variety and Value for Money Destination to Quality Leisure Destination and Green Tourism. It focused on the development of green cities, and strong communities based on security, prosperity, and sustainability. The measures of development towards green cities and strong communities included creation of balance of capability of tourist destinations to accommodate tourism, promotion and support of tourism with social and environmental responsibilities, engagement between the public, people, and private sectors in tourism management. The Strategy of Thailand's Tourism 2015-2017 devised the goals to raise all sectors' awareness of development based on balance and sustainability. It set the goal of income from tourism at 2.5 million baht in 2017 which would enhance the quality of life of communities and the Thai society. The Strategy of Tourism consisted of three strategies as summarized in Figure 2.17 (Ministry of Tourism and Sports, 2015)

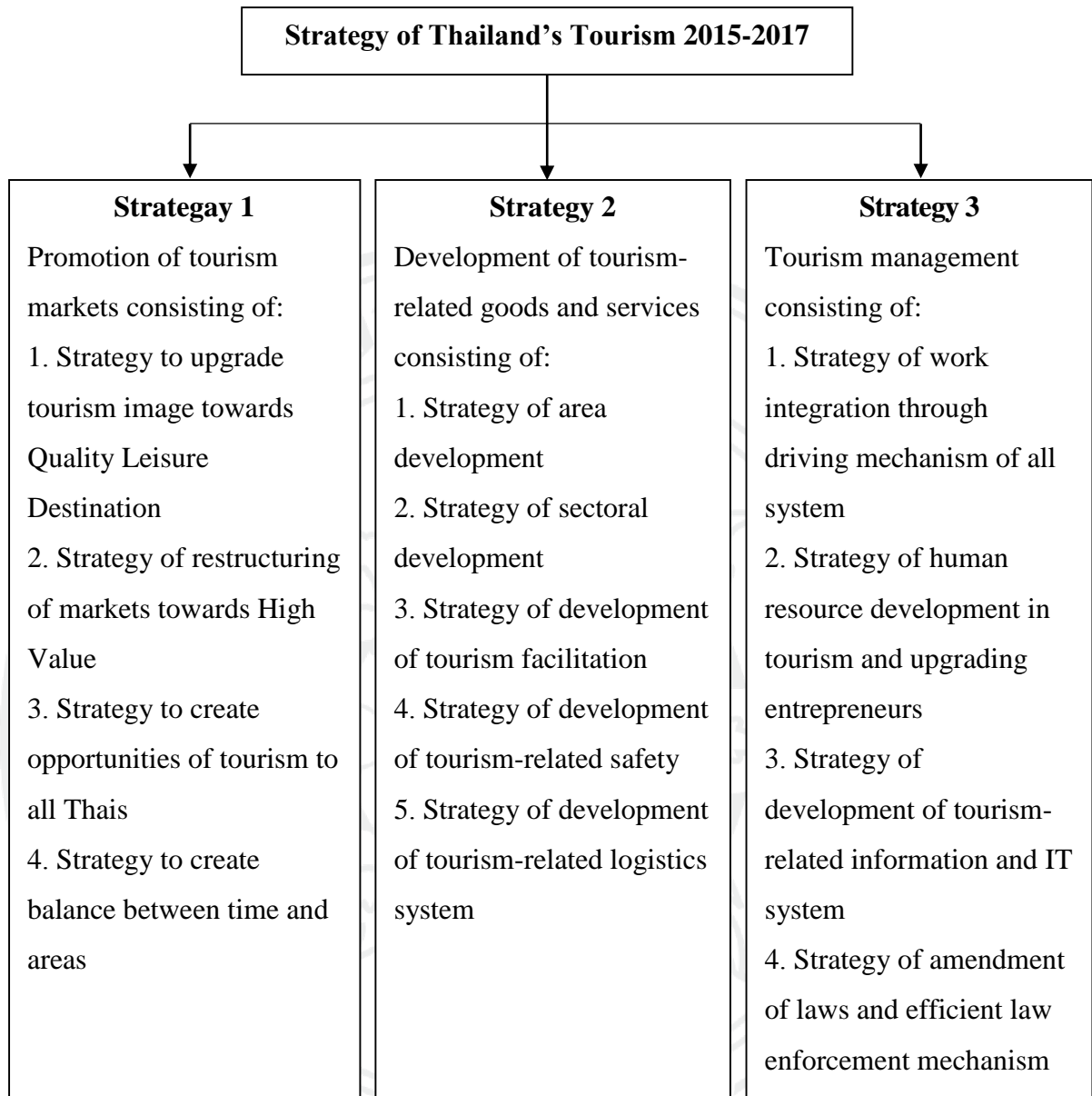


Figure 2.17 Overview of Strategy of Thailand's Tourism 2015-2017

Source: Ministry of Tourism and Sports (2015)

2.5.5 Strategy of Water Resource Management 2015

The Strategic Plan of Water Resource Management are managed by Policy and Water Resource Management Committee for the duration of 12 years (2015-2026). The Strategy of Water Resource Management was devised by adhering to water management in watersheds in the integrated and sustainable manners, the government's policies, national development direction according to the past and present National Economic and Social Development Plans, analysis of water situations and trend of the demand of water usage, and future problems of water shortage, floods, and water quality. It devised the 12-year goals and strategies as framework to solve the problems of water resources (2015-2026) as follows:

- 1) Provide clean water for consumption in sufficient quantity and quality for rural communities (covering all villages in 2017) and urban communities, in economic areas with major tourist destinations.

- 2) Supply water for agriculture, industry, and maintain eco system of communities for basic occupation, agricultural practices by rainwater, sufficient production of communities, supply of water sources to develop according to national goals, development of irrigated agriculture and economy to cater to the expansion of the industry. Potentials and limitations must also be considered in terms of areas, social aspects, communal living, balanced and sufficient control and allocation of water to maintain eco system and balanced management of demand of water use vis-à-vis costs.

- 3) Develop water sources in each watershed to create balance in social, economic, and environmental dimensions, by meeting the minimum demand of water usage of watersheds, water availability for eco system, consumption, and economic development of areas.

- 4) Reduce damage caused by communities in main economic areas by prevention in communities and main economic areas prone to major impact and serious damage. Proactive measures were used to control land exploitation and urban planning measures to reduce future impact, reduce damage caused by flash flood, mudslides, sudden flood by slowing down water in upstream and midstream sources, efficient management of information and warning, reduce damage in critical watershed areas, as

well as improvement of water resource management, and support of adaptation and flee from danger.

5) Water quality management to allow water in main rivers and watersheds with critical quality to reach fair level by focusing on reduction of wastewater from water sources, law enforcement, transfer of knowledge, awareness, and measures to monitor water quality.

6) Rehabilitation of upstream forests up to 40 percent of the country and land exploitation in upstream areas to create balance of water and reduce impact on the problems of water shortage and floods.

7) Management, organization, mechanism, law (including agreements and international cooperation), unified water management, correct and accurate information, speedy implementation, and efficient management.

As for tourism industry, the Strategy of Water Resource Management realized the expansion of tourism. Consequently, it devised the Strategy as an implementing guideline to comply with and suit current and future tourism situations, including water management for consumption, water security in manufacturing sectors, and water quality management. The Strategy aimed to increase efficiency of storing water at water sources especially the areas with high demand of water for consumption, including agricultural and industrial areas, major cities, and cities of tourist destinations. Campaign was launched for the public and tourists to realize the importance of water and the need for economical use of water, change of behavior in using water, use of water-saving equipment or technology, optimum water management by applying 3R principles, decreased volume of wastewater from sources, and reuse of treated wastewater.

According to the study of the reviews of all relevant policies, laws, and measures as mentioned above, the study of water footprint assessment of hotels type 1 in Bangkok was in accordance with international and national policies such as United Nations' Sustainable Development Goals, 20-Year National Strategy (2018-2037), 12th National Economic and Social Development Plan, Tourism Strategy 2015-2017, and Water Management Strategy 2015. The objectives were to develop the potentials of tourism and service businesses for robust growth, promote green tourism, and enhance

efficiency of water management both in quantity and quality in order to respond to the growth of tourism-based economy and environmental-friendly hotels.

2.5.6 Promotional measures of environmental-friendly hotels

Hotels are establishments providing comfort and convenience to guests. The decision to choose accommodations based on the quality of services and environment is one factor that hotel guests use for decision. Therefore, the development of the quality of services and environment is important to create the opportunity to increase the number of hotel guests and increase value to establishments. Presently, there are agencies charged with the promotion of operation of environmental-friendly hotels to enhance entrepreneurs' awareness on the importance of preventing and solving environmental problems, improving internal operation for optimum use of water resource and energy, and developing environmental quality. The agencies promoting operation of environmental-friendly hotel business include Green Hotel Project, Department of Environmental Quality Promotion, and Green Leaf Hotel Project, Green Leaf Foundation.

The environmental-friendly hotel project (Green Hotel) operated to promote the hotel's potential in optimum and efficient use of resources and energy, good environmental management, and upgrading standards of more environmental-friendly services. The Green Hotel plaques and certificates were awarded to the hotels which passed the assessment (Figure 2.18 and Figure 2.19) with six issues of assessment criteria as follows:

Issue 1	Policy on environmental-friendly services
Issue 2	Human resource development
Issue 3	Campaign and public relations on environmental-friendly services
Issue 4	Environmental-friendly procurement
Issue 5	Environmental management and energy preservation
Issue 6	Participation with locals and communities

The criteria for passing the assessment were divided into three levels:

Gold	passed the assessment with scores of over 80 percent
Silver	passed the assessment with scores of over 70 percent but lower than 80 percent
Bronze	passed the assessment with scores of over 60 percent but lower than 70 percent (Department of Environmental Quality Promotion, 2019)



Figure 2.18 Plaque for environmental-friendly hotel

Source: PanomRung Puri (2015)



Figure 2.19 Certificate for environmental-friendly hotel

Source: PanomRung Puri (2015)

The Green Leaf Hotel Project aimed for tourism business operators in Thailand to enhance standards, efficient and environmental-friendly operation, standards of environmental management in business, and efficient technology on tourism-related environment. The Project granted the certificate of green leaf hotel to establishments that passed the assessment by assessing the standards of environmental management in hotel business operation, investigation of operation in each department of any impact on the environment. If the hotels passed the assessment of the criteria for the standards of green leaf hotel project, they would receive certificates as shown in Figure 2.20. The assessment criteria of the green leaf project consisted of questions of 18 sections as follows:

Section 1 Policy and communication, Section 2 Human resource development, Section 3 Committee, Section 4 Goal and action plan, Section 5 Waste management, Section 6 Efficient use of energy, Section 7 Efficient use of water, Section

8 Kitchen and restaurant, Section 9 Laundry, Section 10 Procurement, Section 11 Air quality in buildings, air and noise pollution, Section 12 Water and quality of water, Section 13 Spa and massage for health, Section 14 Fitness gym, swimming pool, and outdoor activities, Section 15 Safety in hotel, Section 16 Impact on eco system, Section 17 Participation with community and local administration, Section 18 Promotion of arts and culture.



Figure 2.20 Certificate of Green Leaf Hotel

Source: Phunacome Resort (2012)

Conclusion for criteria between Green Hotel and Green Leaf as follows table 2.3

Table 2.3 Conclusion for criteria between Green Hotel and Green Leaf

Green Hotel	Green Leaf
<p>Section 1 Environmental Policy</p> <p>The environmental policy serves as guidelines for the management and staff to achieve the objective and targets of the organization.</p>	<p>Section 1 Policy and communication. Does the hotel have an environmental policy for hotel operations?</p>

Green Hotel	Green Leaf
<p>Section 2 Capacity Building</p> <p>To increase knowledge and skills of staffs on environmentally-friendly service.</p>	<p>Section 2 Human Resource Development</p> <p>The hotel arranges training or sends personnel to attend the training. To preserve energy and promote energy efficiency in the past year or not?</p>
<p>Section 3 Public relation and campaigns</p> <p>To raise awareness, understanding, and cooperation among staffs and customers.</p>	<p>Section 3 Committee</p> <p>Does the hotel set up a committee for conservation and energy efficiency?</p>
<p>Section 4 Green procurement</p> <p>Purchasing of products should concern on product quality, price, distance of deliver, and the reduction of environmental impacts from manufacturing processes.</p>	<p>Section 4 Goals and action plans</p> <p>There is an action plan for energy conservation and energy efficiency or not?</p>
<p>Section 5 Environmental management and energy conservation.</p> <p>To concern on sustainable uses of resources; and reduction of waste, pollution, and impacts to the environment.</p>	<p>Section 5 Waste management</p> <p>Have arranged to reduce the volume of sound from the source to prevent the occurrence of waste from all parts of the hotel?</p>
<p>Section 6 Participation with local community</p> <p>To engage with local communities on natural resources and environmental management activities.</p>	<p>Section 6 Energy efficiency</p> <p>Is there any part of the RAM that has the high-power consumption specified in 3 parts? (Kilowatt-hour / month)</p>

 Green Hotel

Green Leaf

Section 7 water use efficiency

Have installed an aerator in the hotel room or not?

Section 8 Kitchen and dining room

Energy conflicts are used by cooking and cooking in the affected areas air conditioning in the kitchen and dining room?

Section 9 Laundry room

Is there a selection of products that can be refilled instead of being used up?

Section 10 Purchasing

Have set up the purchase of seasonally produced food to reduce energy consumption in store, transport, pack, and produce or not?

Section 11 Indoor air quality Air and noise pollution

Have improved, managed or modified parts of the building to be able to reduce and prevent the sound from doing activities outside or not?

Green Hotel	Green Leaf
	<p>Section12 Water and water quality</p> <p>Have checked the leakage of waste water From the waste water drainage of the hotel usually To prevent water contamination Waste to other water sources or not?</p>
	<p>Section13 Spa and massage for health</p> <p>Has been avoided and reduced the use of disposable products in the service phase in establishments to reduce the amount of waste or not?</p>
	<p>Section14 Exercise, swimming pool and outdoor activities</p> <p>Provide a window or light of the exercise place that can be opened to benefits of air circulation, cleaning And safety or not?</p>
	<p>Section15 Hotel safety.</p> <p>Have installed gauges, pressure collection and fuel consumption and gas for the benefit of tracking leakage, loss and improving the efficiency or not?</p>
	<p>Section16 Environmental impact .</p> <p>Is it forbidden to sell forest and sea products in the hotel grounds?</p> <p>Section17 Community engagement And local organizations.</p>

Green Hotel	Green Leaf
	<p data-bbox="948 349 1481 544">Has organized activities to strengthen cooperation in the preservation of natural resources and the local environment on various occasions or not?</p> <p data-bbox="948 568 1430 600">Section18 Art and culture promotion.</p> <p data-bbox="948 663 1481 745">Have organized cultural activities on various occasions during the year or not?</p>

Source: Department of Environmental Quality Promotion (2019) and The Green Leaf Foundation (n.d.)

From the table 2.3 Overall, Green Hotel and Green Leaf are similar criteria. The difference between Green Hotel and Green Leaf finding that Green Hotel had 6 Criterias and Green Leaf had 18 criterias, and Green Hotel include energy natural resources waste in section 5 but Green Leaf Separate each section. The research selected Green hotel for this study because the Green Hotel has been operating for a long time and continuous.

2.6 Relevant Research Works

According to the review of the relevant research works, the study finding both of academic article in water footprint and the most of research works on the study of water footprint assessment related to agriculture such as: The study of Tiewtoy, Suwan, and Somjai (2012) who conducted the study of Water Footprint of Sugarcane and Tapioca for the Production of Ethanol in the East of Thailand. The water footprint from this research could be used as information to accompany the consideration of the policy to promote the use of the country's ethanol. Also, Pongpinyopap and Mungcharoen (2011) conducted the study of Water Footprint of the Production Process of Ethanol from Tapioca in Thailand. Assess the water footprint of the production process of ethanol from tapioca in Thailand, forecast the volume of the use of water, and the use of cultivated land according the 15-Year Alternative Energy Development Plan.

Pongpinyopap et al. (2014) conducted the study on Water Footprint of Dendrobium Orchids in Thailand. The researcher compared water footprint and suitability of cultivating Dendrobium Orchids in Nakhon Pathom, Samut Sakhon, and Ratchaburi Provinces between 2007-2010 and compared the volume of water that farmers in each province used for cultivation and the volume of water that plants needed showed Nakhon Pathom was the appropriate area for the cultivation of Dendrobium Orchids due to the lowest use of water in the entire cultivation process of Dendrobium Orchids compared with Samut Sakhon and Ratchaburi. Finding research of Chooyok, Pumijumnog, and Ussawarujikulchai (2013) study The Water Footprint Assessment of Ethanol Production from Molasses in Kanchanaburi and Supanburi Province of Thailand. The data from these results can be used as the basis for managing water resources not only in Thailand but also in other regions. Also, Jaimung, Ussawarujikulchai, and Nakhapakorn (2014) study Comparison the Water Footprint of Oil Palm Plantation in Surat Thani and Rayong provinces of Thailand that comparison the water footprint of oil palm plantation in Surat Thani and Rayong provinces of Thailand but using water footprint concept. Which is results showed the possibility of to reduced amounts of palm oil plantations area or to made use of the plantation area into other food crops and it can decelerate land use changes for the cultivated area of food crops to energy crops as well, and Pongpinyopap et al. (2014) study Water Footprint Assessment of Palm Oil Biodiesel Production in Southern part of Thailand. Assess the water footprint of biodiesel production from palm oil in Krabi, Chumphon and Surat Thani provinces were selected as study areas. Data from these results can be used as the basis for managing water resources not only in Thailand but also in other regions. Include Werachat Chatpanyacharoen, Natha Hungspreug, Bundit Anurugsa, and Siripun Taweesuk (2015) study Water Footprint Evaluation of *Oryza sativa* L. Tha Wang Pha District, Nan Province. This study is to estimate the green water footprint and grey water footprint of rice product using method of estimation of rainfall requirement. The resulted can be used for water resource management, for setting water resource and nutrient loading in regulatory policy management.

In addition, there were academic article related to trends of water footprint, benefit of water footprint, and obstacles and opportunities of the applicant of water

footprint in Thailand such as Kaewchur (2013) that dealt with water footprint in Thailand in agriculture, food, manufacturing industry, and service industry, including future trend of water footprint study in Thailand. The study of water footprint commonly aimed to obtain water footprint for the topic under the study in order to make use of the study findings to reduce water consumption. Water footprint was therefore a tool of environmental management which would improve environmental operation efficiency, enhance competitiveness in business and good image for entrepreneurs, as well as reduce future water shortage. Entrepreneurs or involved persons should be aware of the changes in global trade toward more interest in and emphasis on environment (Bunprom, 2015; Jawjit, 2013). Therefore, water footprint was crucial that all countries started to realize the importance and accelerate the development. based on the review of all relevant research works, water footprint was still not widespread in Thailand. There had not been many research works. As Thailand was known as an agricultural country consuming a large quantity of water, most research works involved water footprint assessment for agriculture, in line with the study of Kaewchur (2013) that Thailand's agricultural sector was ranked number one in the world for the use of water. The trend of Thailand's water footprint had caught interest in the past 3-5 years. Therefore, there had not been many research works. Most research works involved agriculture.

Also, from the related literature review on water consumption both from research and data and information from relevant agencies, it was found that within the hotel there are many activities that use water such as guest room, pool, laundry, meeting room and kitchen room. The results of the research showed that the highest water usage is the guest room corresponding to the research on Hotel Water Consumption A Case Study in Phuket Province that studies the water consumption of three areas in the hotel includes guest room, pool, and kitchen room which was found that the highest water usage is guest room accounting for 33-64 percent (Seeduka, 2013). As well, the research on Improving Water Use Efficiency in Jamaican Hotels and Resorts Through The Implementation of Environmental Management Systems studies the amount of water used in hotels from various areas which as follow Guest room, Pool, Locker & public bathroom, Steam generation, Laundry, Ground, Kitchen & coldrooms, in which

the highest water usage is guest room of 33 percent (Meade & Gonzalez-Morel, 2011), and the research of A Study of water consumption in two Malaysian resorts that compared between hotels in Langkawi and Miri found that both hotels had the highest water usage in guest room accounting for 44 percent and 45 percent, respectively (Tang, 2012). From data of the annual water consumption of a hotel in Singapore by Singapore Government, it was found that the highest water consumption in hotel in Singapore is guest room of 33 percent. The Public Utilities Board (n.d.-a), and the data from Green Hotelier showed the comparison between three hotels followed Temperate Mediterranean and Tropical getting, the highest water usage is also in guest room Temperate 34 percent, Mediterranean 33.33 percent, and Tropical 34 percent. Therefore, from all related researches, it can be concluded that the highest water usage is in guest room. Therefore, guidelines for water management in hotels should start from the guest room area, and the methodology review also found that all studies of water consumption in hotel got volume total water usage based on main water meter reading which was direct water consumption but HWMI methodology includes both direct water consumption and indirect water consumption which consists of the followed water sources namely Metered water, Unmetered municipal water, Delivered water, District chilled water, On-site waste water treatment, Outsourced laundry, Unmetered ground and surface water, and Private space.

All the mentioned issues constituted the background of this study. It conducted water footprint assessment of hotels type 1 in Bangkok which was service business. The service businesses using a large quantity of water as well included tourism, hotels, department stores, golf courses, and hospitals. Therefore, water footprint assessment in service business was an aspect that needed to be studied due to the continuous tourism-related economic growth, and readiness to deal with demand in water to prevent water shortage. Water management was therefore important. This study also complied with the United Nations who determined Goal 6 that mentioned that water scarcity affected global population. Therefore, by 2030, safe and affordable drinking water, as well as sanitation facilities, must be provided for all (United Nation, 2015). The study was also in line with the 20-Year National Strategy (2018-2037) with the goal of sustainable development, focusing on the development in three dimensions,

economic, social, and environmental, leading to real sustainability for the next generation. On the topic of water security, it also mentioned that “water is sufficiently provided for the urban growth, including habitation, commerce, and services” (National Strategy Secretariat Office, 2018). The 20-Year National Strategy, the country’s Master Plan, was used to formulate the strategy of national development in accordance with the 12th National Economic and Social Development Plan. It would contribute to strengthening tourism and service businesses, developing certification system of standards, aligning business and service standards with international standards, upgrading quality in response to the markets’ needs in parallel with environmental-friendly growth, promoting green tourism, enhancing water management efficiency in both quantity and quality, promoting footprint labels and other environmental labels, and developing product life cycle assessment leading to footprint standards (Office of the National Economic and Social Development Board, n.d.). The Strategic Plan of the Ministry of Natural Resources and Environment 2016-2021 was formulated in accordance with the United Nations’ Sustainable Development Goals, 20-Year National Strategy (2018-2037), 12th National Economic and Social Development Plan (2017-2021). It devised Strategy 2: Water management, Goal 17: Sufficient water for consumption, Sub-strategy 47: Water management for sustainable benefit. Department of Water Resources, Department of Groundwater Resources, and Office of the Permanent Secretary for the Ministry of Natural Resources and Environment were assigned as driving agencies under Strategy 2 (Office of The Permanent Secretary for Ministry of Natural Resources and Environment, n.d.).

CHAPTER 3

CONCEPTUAL FRAMEWORK AND METHODOLOGY

The study of the assessment of water footprint of hotels type 1 in Bangkok included the study and review of relevant concepts, theories, and research, as well as defined the conceptual framework and the study processes as follows:

3.1 Research Conceptual Framework

The researcher defined the research conceptual framework to construct interview questions for policy makers and awarded environmentally-friendly hotels (Green Hotels) and questionnaires for hotels type 1 in Bangkok by reviewing and applying the concepts and theories of PEST Analysis, McKinsey 7S Model, and HWMI Methodology 2016 in this study. The researcher applied McKinsey 7S Model in the study of internal factors impacting water management of hotels type 1 and applied PEST Analysis in the study of external factors impacting water management. The study applied PEST Analysis by adding E (Environment) as environmental factor and L (Legal) as legal factor that covered the content of the study. Therefore, this study can be said to be a PESTLE Analysis. HWMI Methodology 2016 was also used for the calculation of water footprint of hotels type 1. Subsequently, the researcher defined issues in order to develop them into tools, namely interview questions and questionnaires to construct questions that would cover all issues of the study as shown in Figure 3.1.

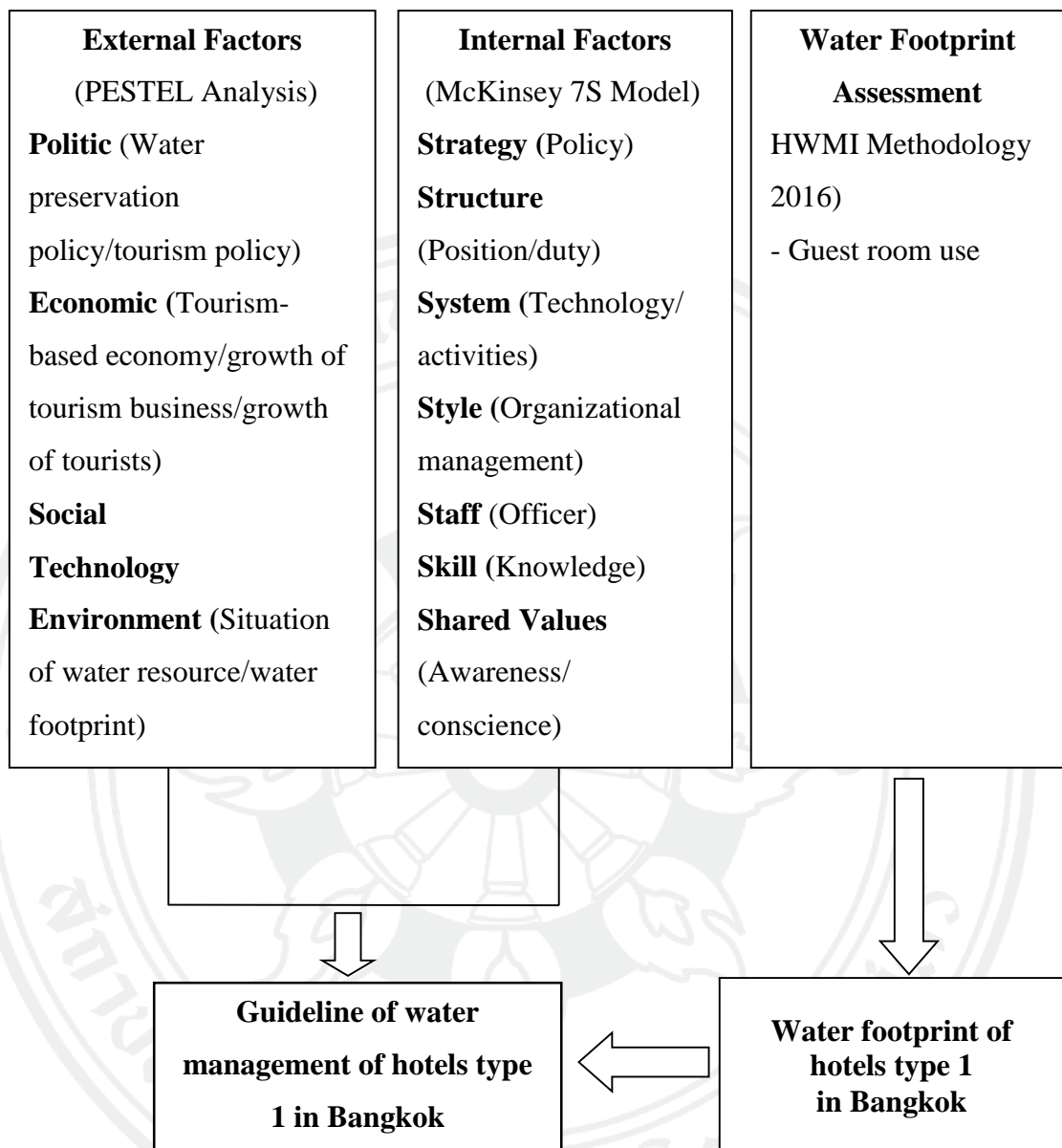


Figure 3.1 Conceptual Framework

3.2 Methodology

3.2.1 Suitability Assessment of Conceptual Framework and Indicators by Experts

Based on the study and review of PESTEL Analysis namely Politic, Economic, Social, Technology, Environment, and Legal (Petchjatuporn, 2019), and McKinsey 7S Model namely Strategy, Structure, Style, System, Staff, Skill, and Shared Value (McKinsey Quarterly, 2008) as well as HWMI Methodology 2016, the researcher determine indicators to construct interview questions and questionnaires and constructed assessment form of conceptual framework and indicators by experts to assess the suitability of conceptual framework and indicators, including water footprint assessment, indicators of external factors, indicators of internal factors, as well as additional recommendations as follows:

Indicators of external factors, namely:

- 1) **Water preservation policy** means policy, strategy, and action plan to support environment for water.
- 2) **Tourism policy** means policy, strategy, and action plan to support environment for hotel business.
- 3) **Tourism-based economy** means current trend of environmental preservation for tourists and hotel business.
- 4) **Growth of tourism business and tourists** means tourism service activities that generates income for entrepreneurs and the government and the number of tourists visiting Thailand has increased.
- 5) **Social** means Social trends, interest in eco-friendly hotels.
- 6) **Technology** means Water saving equipment.
- 7) **Situations of water resource** means the amount of water used for consumption is sufficient for Thailand.
- 8) **Water Footprint** means the amount of water use of 1 hotel guest/1 night in cubic meters.

9) **Laws** means measures to force incentives for Water Footprint That the authority has enacted for the operator Hotel business comply.

Indicators of internal factors, namely:

- 1) **Organizational policy** means hotel water preservation policy.
- 2) **Reward** means reward for employees who have achieved their goals.
- 3) **Duty** means responsibilities for the job corresponding to the position.
- 4) **Knowledge** means staff have knowledge and know-how for water conservation.
- 5) **Cooperation** means delight in implementing the policy for success in receiving an environmentally-friendly hotel.
- 6) **Technology** means water saving equipment.
- 7) **Monitoring** means investigate the damage of water equipment. And the absorption in various areas within the hotel and monitor the performance of employees.
- 8) **Awareness** means operate with thought of saving water.

3.2.2 Interview Questions for Policy Makers by applying PESTEL Analysis to construct Questions

Table 3.1 Interview Questions for Policy Makers by applying PESTEL Analysis to construct Questions

Dimensions	Questions	Methods of information collection	Informants
P (Politic)	Policy, strategy, and action plan to support environment for hotel business	Interview	DEQP, TAT, MASCI representative

Dimensions	Questions	Methods of information collection	Informants
E (Economic)	Current trend of environmental preservation for tourists and hotel business	Interview	DEQP, TAT, MASCI representative
	Recognition and awareness of environmentally-friendly labels or rewards	Interview	DEQP, TAT, MASCI representative
S (Social)	Hotel cooperation to participate in environmentally-friendly hotels project	Interview	DEQP, TAT, MASCI representative
T (Technology)	Water-saving equipment, guideline of sustainable water management for hotel business	Interview	DEQP, TAT, MASCI representative
	Opinions on water footprint	Interview	DEQP, TAT, MASCI representative
E (Environment)	Application of water footprint for hotel business	Interview	DEQP, TAT, MASCI representative
	Activities and projects relevant to water preservation	Interview	DEQP, TAT, MASCI representative
L (Legal)	Measures to apply water footprint in hotel business	Interview	DEQP, TAT, MASCI representative

Note: DEQP is Department of Environmental Quality Promotion. TAT is Tourism Authority of Thailand. MASCI is Management System Certification Institute (Thailand).

3.2.3 Interview Questions for Hotel Operators by applying McKinsey 7S Model to construct the Questions:

Table 3.2 Interview Questions for Hotel Operators by applying McKinsey 7S Model to construct the Questions

Dimensions	Questions	Methods of information collection	Informants
Strategy	- Current environmental preservation trend in hotel business	Interview	Green Hotel representative
	- Support from public or private sector to operate environmentally-friendly hotels project	Interview	Green Hotel representative
	- Hotel's policy and action plan on environment	Interview	Green Hotel representative
Structure	- Personnel management for hotel's internal water management	Interview	Green Hotel representative
	- Hotel's internal water preservation activities	Interview	Green Hotel representative
System	- Application of water footprint in hotel business	Interview	Green Hotel representative
	- Factors impacting success and problems to apply water footprint in hotel business	Interview	Green Hotel representative

Dimensions	Questions	Methods of information collection	Informants
Style	- Guideline of sustainable water management for hotel business	Interview	Green Hotel representative
Skill	- Hotel's internal water management methods - Recommendations of water management for hotels type 1	Interview	Green Hotel representative
Shared Value	- Recognition and awareness of environmentally-friendly labels and rewards such as green hotels, carbon footprint, water footprint - Image of environmentally-friendly hotels	Interview	Green Hotel representative
Skill/Staff/System	- Factors for hotels to receive awards for environmentally-friendly hotels	Interview	Green Hotel representative

3.2.4 Interview questions for were based on the application of PESTEL Analysis and McKinsey 7S Model to construct questions consisting of questionnaires of opinions on external factors impacting water and wastewater management and opinions on internal factors impacting water and wastewater management of hotels type 1 in Bangkok as follows:

Table 3.3 Opinions on External Factors Impacting Water and Wastewater Management of Hotels Type 1 in Bangkok

Dimensions	Questions	Methods of information collection	Informants
Politic	- Government sector's policy and measures to promote tourism	Questionnaire	Representative of hotel type 1
	- Government sector's policy and measures to promote water preservation	Questionnaire	Representative of hotel type 1
Economic	- Situations of tourism-based economy and growth of tourism business resulting in increased number of hotel guests	Questionnaire	Representative of hotel type 1
	- Increased number of tourists impacting increased water use	Questionnaire	Representative of hotel type 1
	- Water footprint enhancing hotel's good image	Questionnaire	Representative of hotel type 1
Social	- Safety from epidemics, water-related diseases from consumption of tap water in Bangkok impacting hotel business operation	Questionnaire	Representative of hotel type 1
Technology	- Use of water-saving equipment that helps save	Questionnaire	Representative of hotel type 1

Dimensions	Questions	Methods of information collection	Informants
	water in hotel, helps reduce water consumption and water costs		
	- Water resource is crucial to hotel business	Questionnaire	Representative of hotel type 1
Environment	- Potential shortage of tap water in Bangkok will cause damage to hotel business	Questionnaire	Representative of hotel type 1
	- Quality of tap water in Bangkok will impact hotel business operation	Questionnaire	Representative of hotel type 1
	- Potential water pollution in Bangkok will cause damage to hotel business	Questionnaire	Representative of hotel type 1
Legal	- Law to enforce all hotels to assess water footprint	Questionnaire	Representative of hotel type 1
	- Government sector's promotion measure to reward hotels that can reduce water consumption	Questionnaire	Representative of hotel type 1

Table 3.4 Opinions on Internal Factors Impacting Water and Wastewater Management of Hotels Type 1 in Bangkok

Dimensions	Questions	Methods of information collection	Informants
Strategy	- Hotel's internal policy and strategy on water preservation	Questionnaire	Representative of hotel type 1
	Hotel's internal activities on water preservation	Questionnaire	Representative of hotel type 1
	- Awards to department or employee with awareness of water preservation while performing work	Questionnaire	Representative of hotel type 1
Structure	- Assign duty to employee that matches his/her position, knowledge, and ability	Questionnaire	Representative of hotel type 1
System	- Use of water-saving equipment and toilets that help save water in hotel	Questionnaire	Representative of hotel type 1
	- Re-use of used water for other activities	Questionnaire	Representative of hotel type 1
	- Wastewater treatment before discharge into public water sources	Questionnaire	Representative of hotel type 1
Style	- Monitoring, investigation, and assessment of the performance of each department or each employee in implementing	Questionnaire	Representative of hotel type 1

Dimensions	Questions	Methods of information collection	Informants
Staff	<p>policy, action plan, or activities on water preservation</p> <ul style="list-style-type: none"> - Check leaked pipes in hotel, as well as damage or leakage of water-using equipment - Placing labels, posters, or boards in hotel guest rooms or hotel vicinity to encourage guests and employees to preserve water - Problem of tap water shortage - Problem of water pollution - Personnel realize the importance of water resource - Hotel personnel cooperate to preserve water in hotel 	<p>Questionnaire</p> <p>Questionnaire</p> <p>Questionnaire</p> <p>Questionnaire</p> <p>Questionnaire</p>	<p>Representative of hotel type 1</p> <p>Representative of hotel type 1</p> <p>Representative of hotel type 1</p> <p>Representative of hotel type 1</p> <p>Representative of hotel type 1</p>
Skill	<ul style="list-style-type: none"> - Provide training on water preservation for personnel or send personnel to attend training with external agencies - Water footprint assessment can help save water and reduce water costs 	<p>Questionnaire</p> <p>Questionnaire</p>	<p>Representative of hotel type 1</p> <p>Representative of hotel type 1</p>
Shared values	<ul style="list-style-type: none"> - Cooperation with public or private sector by providing knowledge and inviting hotel to 	<p>Questionnaire</p>	<p>Representative of hotel type 1</p>

Dimensions	Questions	Methods of information collection	Informants
	participate in water footprint assessment project		



As for the part of water footprint assessment, the researcher studied the HWMI Methodology 2016 which would be used as information to assess water footprint of hotels type 1 in Bangkok as follows:

- 1) Hotel information
- 2) Floor area
- 3) Water sources and usage
- 4) Occupancy

The information was used to form the basis of questions for the questionnaires. The information was used to calculate the amount of water usage of 1 hotel guest/1 night.

3.3 Study Processes

3.3.1 Study, review and compilation of secondary information

The study, review, and compilation of secondary information was conducted based on books, academic articles, research articles, academic works, relevant research works, and relevant information disseminated on the Internet. The topics of study included the following:

- 1) Water footprint and ISO 14046: 2015
- 2) PESTEL Analysis, McKinsey 7S Model, and HWMI Methodology 2016
- 3) Water management
- 4) Hotels
- 5) Relevant policy, laws, and measures
- 6) Relevant research

3.3.2 Based on the study, review, and compilation of secondary information, the researcher constructed the conceptual framework, defined questions, and proceeded to experts to assess the suitability according to the assessment form of conceptual framework and indicators.

3.3.3 The results of the assessment of conceptual framework and indicators were used to construct questions to be used to collect information for the study as shown in table 3.1-3.2

3.3.4 Collect information via interviews and questionnaires.

3.3.5 Conduct data processing via descriptive methodology and assess water footprint via calculation based on HWMI Methodology 2016.

3.4 Sample of Informants

3.4.1 The sample included hotels type 1 in Bangkok registered with Department of Provincial Administration, Ministry of the Interior, with the following selection criteria:

- 1) Selection of only hotels type 1 which are hotels that provide services of only accommodations according to the Ministerial notification determining types and criteria of hotel business operation B.E. 2551 (2008)
- 2) There are in total 93 hotels type 1 in Bangkok, divided into 3 groups according to the districts of Bangkok as follows:

Table 3.5 Information was collected using 93 questionnaires

Bangkok districts	List of districts	Number of hotels type 1
21 inner districts	1. Phra Nakhon*	69 hotels
	2. Pom Prap Sattru Phai*	
	3. Samphanthawong*	
	4. Pathum Wan*	
	5. Bang Rak*	
	6. Yan Nawa	
	7. Sathon*	
	8. Bang Kho Laem	
	9. Dusit	

Bangkok districts	List of districts	Number of hotels type 1
	10. Bang Sue	
	11. Phaya Thai*	
	12. Ratchathewi*	
	13. Huai Khwang	
	14. Khlong Toei*	
	15. Chatuchak*	
	16. Thon Buri*	
	17. Khlong San*	
	18. Bangkok Noi	
	19. Bangkok Yai	
	20. Din Daeng*	
	21. Watthana*	
	1. Phra Khanong	
	2. Prawet	
	3. Bang Khen	
	4. Bang Kapi*	
	5. Lat Phrao*	
	6. Bueng Kum	
	7. Bang Phlat	
	8. Phasi Charoen*	
18 middle districts	9. Chom Thong	18 hotels
	10. Rat Burana*	
	11. Suan Luang	
	12. Bang Na*	
	13. Thung Khru	
	14. Bang Khae*	
	15. Wang Thonglang*	
	16. Khan Na Yao*	
	17. Saphan Sung*	

Bangkok districts	List of districts	Number of hotels type 1
	18. Sai Mai	
	1. Min Buri*	
	2. Don Mueang*	
	3. Nong Chok	
	4. Lat Krabang*	
	5. Taling Chan*	
11 outer districts	6. Nong Khaem	6 hotels
	7. Bang Khun Thian	
	8. Lak Si*	
	9. Khlong Sam Wa	
	10. Bang Bon	
	11. Thawi Watthana	

* Note: Districts where hotels type 1 are situated as per July 11, 2018.

3.4.2 Informants

1) Three policy makers follow Department of Environmental Quality Promotion (DEQP), Tourism Authority of Thailand (TAT). MASCI is Management System Certification Institute (Thailand) (MASCI) representative. Interviews with policy makers who were representatives of agencies involved in hotel business and environment in order to learn of the policy on hotel and tourism, policy on water management, trend of business of environmental-friendly hotels, and application of water footprint to hotel business in Thailand.

2) Seven representatives of awarded environmentally-friendly hotels (Green Hotels). To know water management in the hotels with Green Hotel awards (environmental-friendly hotels) on the policy, direction, and implementation in order to pass the assessment according to the standard criteria of Green Hotel Project.

3) Ninety-three representatives of hotels type 1 in Bangkok Metropolitan. In order to learn of the direction and methods of water management of hotels type 1 in Bangkok.

3.5 Information-Collecting Tools

The tools used in this study included interview form for policy makers, interview form for representatives of awarded environmentally-friendly hotels (Green Hotels) and questionnaire for representatives of hotels type 1 in Bangkok. The interview questions were constructed from the conceptual framework and indicators, the suitability of which passed the assessment of experts. The details of the assessment form of the conceptual framework and indicators, as well as interview form, are shown herewith:

1) Assessment form of conceptual framework and indicators

- Part 1 General information of assessors
- Part 2 Assessment of conceptual framework and recommendations
- Part 3 Suitability assessment of indicators, water footprint assessment of hotels type 1 in Bangkok

(Details in Appendix A)

2) Questionnaire for policy makers

- Part 1 General information such as: Name-surname and position of interviewed person, date of interview
- Part 2 Questions on policy

(Details in Appendix B)

3) Questionnaire for representatives of awarded environmentally-friendly hotels (Green Hotels)

Part 1 General information such as: Name of hotel, location of hotel, name-surname and position of the interviewed person, date of interview

Part 2 Questions on current environmental preservation trend of hotel business.

Part 3 Questions on hotel's internal water management.

Part 4 Questions on opinions on water footprint assessment for hotel business and recommendations.

(Details in Appendix C)

4) Questionnaire for representatives of hotels type 1 in Bangkok

Part 1 General information of informants such as: Name of hotel, location of hotel, position of informant, duration of work in the hotel

Part 2 Information used to assess water footprint as follows:

- Amount of yearly consumption of tap water (average of 5 years between 2013-2018)

- Hotel space, guest room space, space of other rooms, rented space in hotels type 1, number of hotel guests, laundry

Part 3 Opinions on external factors impacting water and wastewater management of hotels type 1 in Bangkok

Part 4 Opinions on internal factors impacting water and wastewater management of hotels type 1 in Bangkok

(Details in Appendix D)

3.6 Information Analysis

After compilation of all information, information obtained from interviews and questionnaires was statistically analyzed, summarized, and presented via descriptive methodology.

3.6.1 Water footprint assessment via calculation

The information obtained from the questionnaires was calculated to assess the water footprint based on HWMI Methodology applied to hotels type 1 which provided accommodation services in Bangkok, with use of tap water as the water source. The following information was used:

1) Hotel A floor space

- (1) Total hotel floor area (square meter)
- (2) Total number of guests (per year)
- (3) Total number of guest rooms (per year)
- (4) Number of occupied guest rooms (annual)
- (5) Total floor area of guest rooms (square meter)

2) Total Water

- (1) Metered municipal (mains) water (cubic meter)
- (2) Outsourced laundry (ton)
- (3) Private space (square meter)

As the area in this study was Bangkok, the total water consumption is tap water, there was no information on the use of irrigated water or underground water. Therefore, the calculation of water footprint of hotel type1 in Bangkok was as follows:

The total use of water (A). Guest room use (B) and Total guest rooms use (D) as shown in Figure 3.2

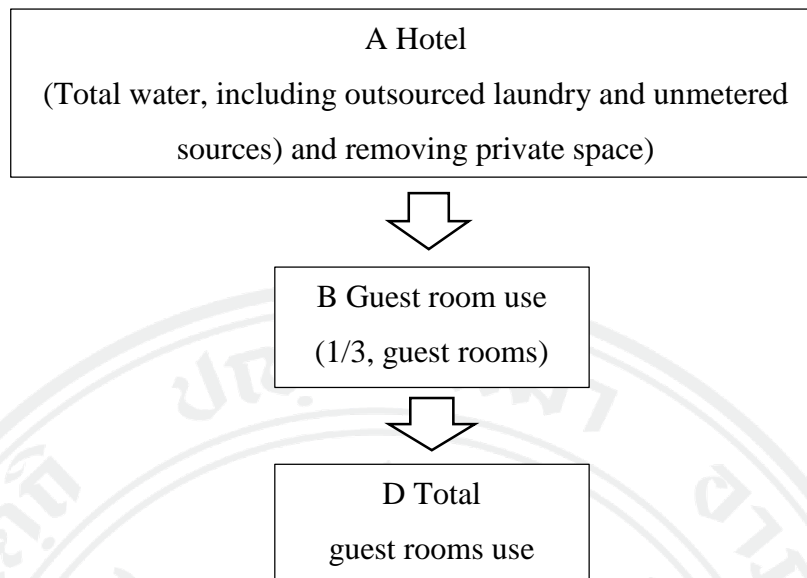


Figure 3.2 Division of share of total use of water

Source: The International Tourism Partnership (ITP) (2016a)

After dividing the share, the data was entered into the following equation:

$$\text{Total per guest (per night)} = \text{Total guest rooms use} / \text{Total number of guests (per year)}$$

The result was the amount of water use of 1 hotel guest/1 day in cubic meters.

3.6.2 Analysis of findings was based on interviews of policy makers in order to acquire information on policy, policy implementing guideline, and application of water footprint in hotel business.

The analysis was also based on interviews of representatives of awarded environmentally-friendly hotels (Green Hotel) in order to determine the guideline of hotels' internal water management, as well as comment on the application of water footprint in hotels.

3.6.3 Analysis of the findings was based on questionnaires of hotels type 1 in Bangkok via the use of statistical program to acquire information on water management and comment on the application of water footprint.

The study findings were synthesized to arrive at the guideline of sustainable water management for hotels type 1 by using PESTEL, McKinsey 7S Model, as well as present the water footprint of hotels type 1 in Bangkok.



CHAPTER 4

Findings

The findings of the water footprint assessment of hotels type 1 in Bangkok in accordance with the three objectives of the study consisted of the following:

- 4.1 Development of a conceptual framework and indicators
- 4.2 Policies, measures, regulations, and water footprint of hotels
- 4.3 Lessons learned, importance, and internal water management of Green Hotel award winning hotels
- 4.4 Study findings of internal water management of hotels type 1
- 4.5 Water footprint assessment of hotels type 1
- 4.6 Guideline for internal water management of hotels type 1 in Bangkok

The water footprint assessment of hotels type 1 in Bangkok was in concordance with the ministerial notification that determines the types and criteria of hotel business operation B.E. 2551 (2008). Hotels type 1 are defined as hotels providing services for accommodation only. The researcher started the study with the conceptual framework and indicators so as to investigate the appropriateness of the conceptual framework and indicators, including compilation of experts' recommendations to improve the conceptual framework and indicators in order to construct questions for the interviews and questionnaires, as well as study of policies, measures, regulations, and water footprint of hotels. The researcher conducted a review of policies both at national and international levels related to the hotel business and the environment, and conducted interviews with policy makers who were representatives of agencies involved in the hotel business and the environment in order to learn of the policies regarding hotels and tourism, policies concerning water management, trends in the business of environmentally-friendly hotels, and the application of the concept of water footprint to the hotel business in Thailand.

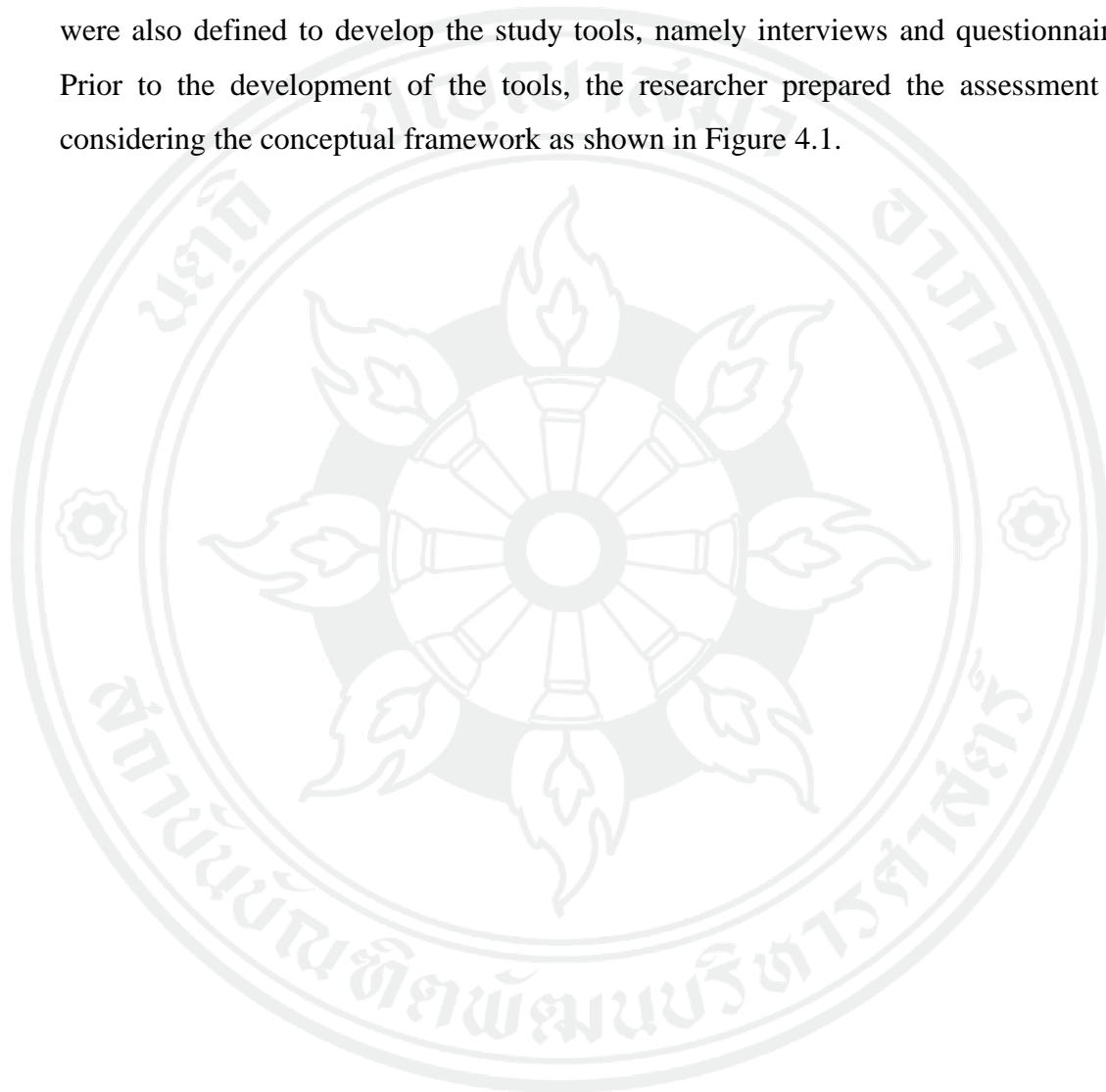
Subsequently, the researcher conducted a study of the lessons learned, importance, and water management of award-winning Green Hotels to gain insights into their water management practices in terms of policy, direction, and implementation in order to meet the requirements of the criteria of the Green Hotel Project. Next, a study of the water management of hotels type 1 was undertaken to learn of the direction and methods of the water management practices of hotels type 1 in Bangkok. The study of water footprint assessment of hotels type 1 was conducted to gather data on the volume of water use for one hotel guest/night leading to the recommendations made in the guideline for the water management of hotels type 1. The researcher would also use the findings of the study of water management of award-winning Green Hotels and apply them to the context of hotels type 1 in Bangkok.

4.1 Development of Conceptual Framework and Indicators

4.1.1 Background of Conceptual Framework and Indicators

Based on the review of concepts and theories, the researcher applied PEST Analysis, McKinsey 7S Model, and HWMI Methodology in this study. The researcher used the McKinsey 7S Model for the study of the guideline of water management of environmentally-friendly awarded Green Hotel and the guideline of water management of hotels type 1 in Bangkok. The researcher also used PEST Analysis which consisted of P (Political), E (Economic), S (Social), T (Technology) and added E (Environment) as the environmental factor and L (Legal) as the legal factor. Therefore, a PESTLE Analysis was used to examine the external factors impacting water management of hotels type 1. As the external factors were uncontrollable, the study enabled the researcher to view the overall external environment of an organization, impacting both positively and negatively, on the organization, both at present and in the future. The researcher chose McKinsey 7S Model to study the internal factors in organizational management consisting of Strategy, Structure, Style, System, Staff, Skill, and Shared Value (McKinsey Quarterly, 2008) to investigate the internal factors of each dimension, whether there should be changes leading to efficiency for the team and organization through improvement, planning, strategic planning, leading to efficient internal

management of organization (Eiamsri, 2011; Petchjatuporn, 2019). The analysis dealt with internal and external environments used in organizational management toward success. Therefore, the researcher chose PESTEL Analysis and McKinsey 7S Model to present the guideline of water management of hotels type 1 in Bangkok. The HWMI Methodology 2016 was also used to calculate the water footprint of hotels type 1. Issues were also defined to develop the study tools, namely interviews and questionnaires. Prior to the development of the tools, the researcher prepared the assessment by considering the conceptual framework as shown in Figure 4.1.



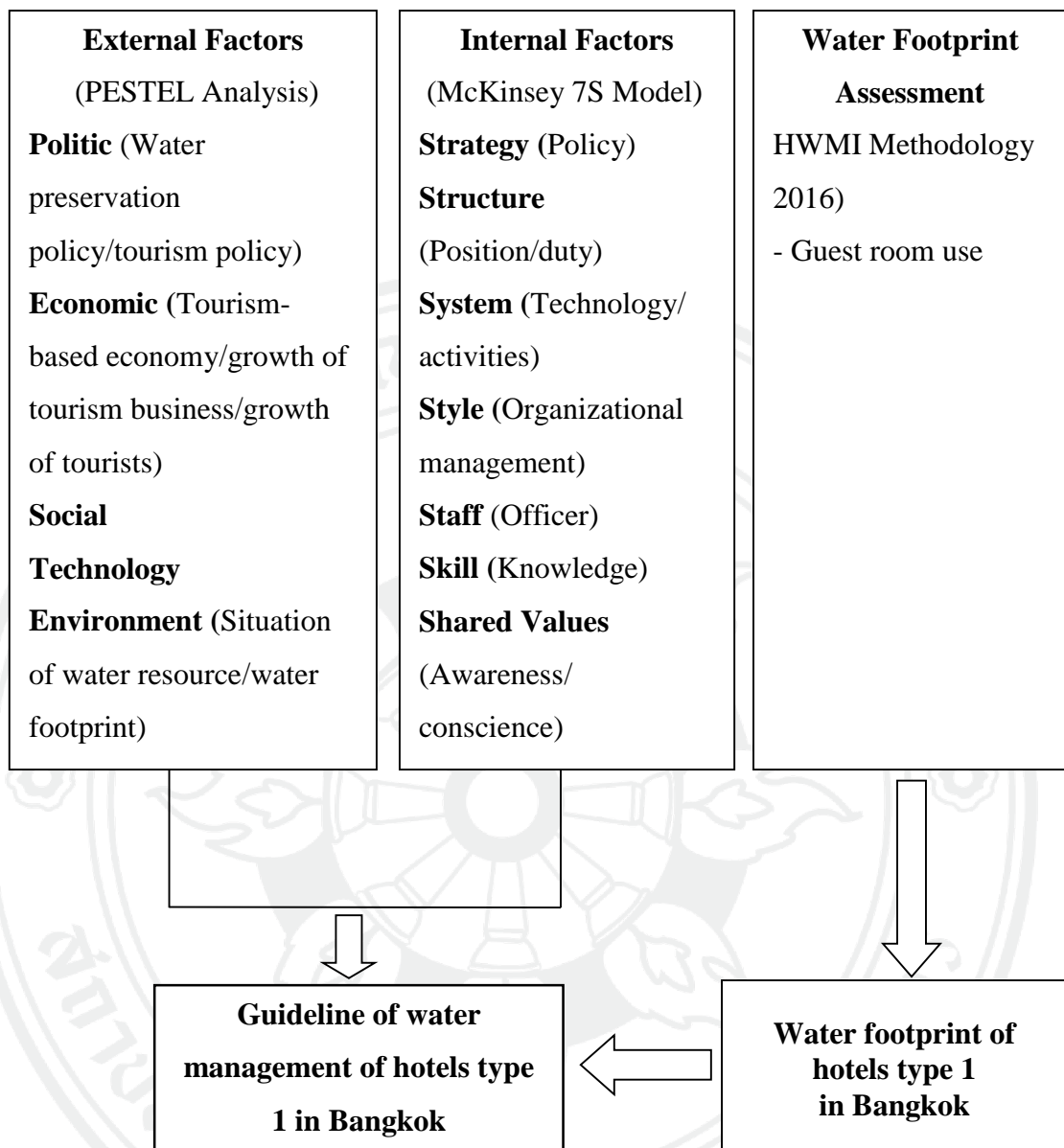


Figure 4.1 Conceptual Framework

Based on this conceptual framework, the suitability of which passed the experts' assessment, the researcher used PESTEL Analysis, McKinsey 7S Model, and HWMI to formulate the conceptual framework for the study of the water footprint assessment of hotels type 1 in Bangkok. The external factors were used to construct the questions for the interviews with policy makers to discover the external factors impacting their water management, feasibility, and problems or threats to apply water footprint assessment to their business and develop a guideline of water management for the hotel business.

The internal factors were used to construct the questions for the interviews with informants from award-winning Green Hotels to develop the guideline for water management that passed the standard criteria of the Green Hotel Project of the Department of Environmental Quality Promotion in terms of policy, guideline, and methods for efficient water management. The obtained information would be used to adapt the guideline of appropriate water management for hotels type 1 in Bangkok to reduce water footprint. As for the questionnaire for hotels type 1 in Bangkok, internal factors were used to construct questions to understand the current situation regarding implementation of water management, or if there were any drawbacks to the implementation of efficient water management, and water footprint assessment in compliance with HWMI in order to quantify the volume of the use of water for one hotel guest/night.

4.2 Policies, Measures, Regulations, and Water Footprint of Hotels

A review of relevant policies and interviews with executives and personnel who were representatives from the public and private sectors responsible for formulation of policies and measures related to hotel business was conducted. The results of the review of policies and interviews consisted of the following:

4.2.1 Analysis and Summary of Relevant Policies

Countries around the world have placed importance and realized the potential impact of water resource problems. International cooperation has been sought to achieve the SDGs as devised by the UN by implementing action plans based on the context of individual countries. The researcher compiled water resource-related information to conduct a review and formulate a guideline in accordance with the world situation and relevant policies and measures, at national and international levels, as shown in Figure 4.2.

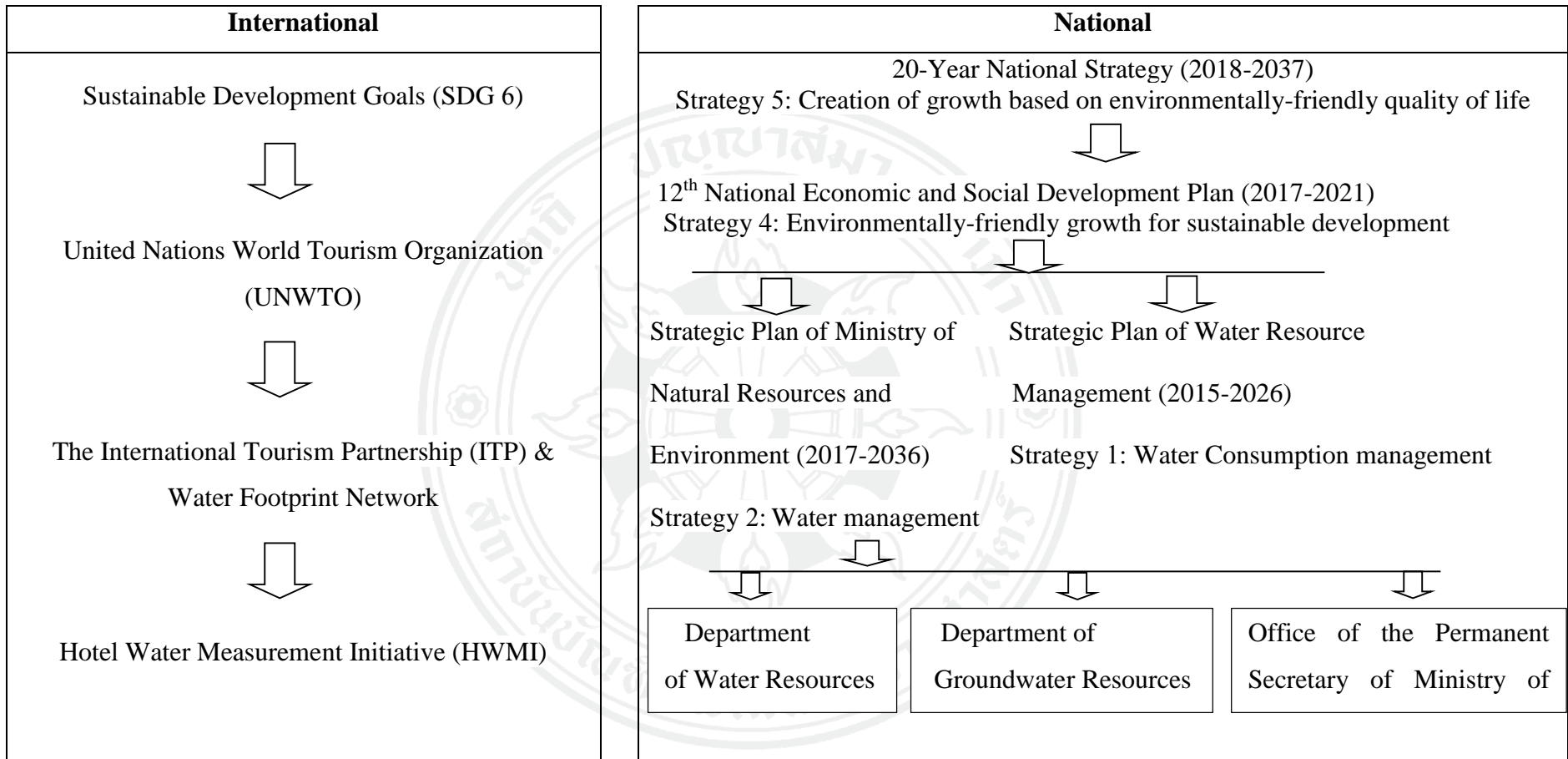


Figure 4.2 Linkage of Various Plans at International and National Levels

The UN defined eight issues in the Millennium Development Goals (MDGs) to promote the standard of living and quality of life, ending in 2015, and defined the SDGs to be implemented between 2015-2030 with 17 goals of sustainable development. Goal 6 (SDG 6) stated that “the problem of water shortage affects over 40% of the world population. It is expected that with the global warming derived from climate change, although the population of 2,100 million have had clean water for consumption and good health since 1990, there will be fewer sources of safe drinking water and will pose problems affecting all continents. Therefore, by 2030, there must be safe, clean drinking water and hygienic facilities provided to people at all levels, as well as prevention and rehabilitation of eco-system related to water such as forests, mountains, rivers, and wetlands which are necessities requiring care, if we are to reduce the problems of water shortage. Moreover, international cooperation is still needed to promote efficient use of water and support water treatment technology in developing countries” (United Nation, 2015). Therefore, countries have come together to drive sustainable development to reach the goals by adapting them as appropriate to each country, including national policies, projects, and various activities.

The World Tourism Organization (WTO) is a UN agency charged with promotion of responsible and sustainable tourism. As a leading international tourism organization, WTO’s role is to promote tourism as part of economic growth, social awareness, and environmental and sustainable development. It also supports all sectors in the development of policy, knowledge, and tourism worldwide, and is committed to promote tourism to reach the SDGs worldwide. WTO consists of 150 member countries including Thailand, associate members of six countries, and partners of over 500 organizations who are representatives of the private sector, academic institutes, tourism associations, and local tourism agencies (The World Tourism Organization (UNWTO), n.d.) One of the partner organizations of WTO related to hotel tourism and accommodations worldwide is the International Tourism Partnership (ITP). ITP is an agency charged with the promotion of responsible and sustainable tourism and development of new equipment and knowledge in order to share knowledge and serve as a guideline to hotels and accommodations worldwide. ITP responded to the SDGs by recognizing the problems of both increased demand for water and water shortage in

the future. ITP's goal regarding water was defined as follows: "ITP commits to support increased water-use efficiency, sustainable withdrawals and supply of freshwater to address water scarcity and reduce the number of people affected by water scarcity by embedding water stewardship programmes across hotel portfolios." This supports Goal 6.4: Sustainable development by stating increased efficiency of water use and solutions to problems of water shortage through cooperation with the Water Footprint Network, an organization with a network of cooperation between companies, organizations, and individuals, to solve the global problems of water crisis to ensure the appropriate and smart use of water. It jointly established the standards for equipment of the HWMI so that hotels could conduct their own water footprint assessment. The hotels would thus know the volume of water used by one hotel guest/night and consider the guideline to use water for maximum benefit and reduce the use of water (The International Tourism Partnership (ITP), 2016b)

As for Thailand, the government formulated the 20-Year National Strategy (2018-2037) to reach the SDGs and to serve as a framework to formulate plans in concordance with the national strategy. One of the national strategies concerning the environment is Strategic Issue 5: Creation of growth based on environmentally-friendly quality of life. It states that "it aims for important development leading to the sustainable development goals in all dimensions, including social, economic, environmental, as well as governance, and cooperation partnership, both inside and outside the country through integration. Area is used to formulate strategies and action plans and engage all stakeholders for direct participation as much as possible. It is based on common growth, whether economic, environmental, and quality of life, placing importance on creation of balance of the three dimensions, leading to true sustainability of the next generation." Regarding water security, it states that it is essential to "provide sufficient water for urban growth, including residential, commercial, and services." The 20-Year National Strategy which is the country's master plan served as the framework to devise the 12th National Economic and Social Development Plan (2017-2021). It defined the environmental issue in Strategy 4: Environmentally-friendly growth. It mentioned the problems of water resource as "water resource has a part that cannot be allocated as desired and risks future shortage. The goal is therefore defined

for water resource management to solve the problems of water shortage, with economic, social, and environmental impacts.”

Therefore, the Ministry of Natural Resources and Environment, an agency that drives the strategies and measures of conservation, rehabilitation, and appropriate use of natural resources and environment, devised the Strategic Plan of the Ministry of Natural Resources and Environment (2016-2021) to enable agencies under its responsibility to implement the strategic plan. This Strategic Plan was established in concordance with the UN’s SDGs. One target that involved the Ministry of Natural Resources and Environment was Goal 6: Sustainable water and sanitation management, the 20-Year National Strategy (2018-2037) in Strategy 5: Creation of growth on environmentally-friendly quality of life, and the 12th National Economic and Social Development Plan (2017-2021) in Strategy 4: Environmentally-friendly growth. Plans and projects were devised under the Strategic Plan of the Ministry of Natural Resources and Environment (2016-2021) in concordance with the above action plans. This Strategic Plan included Strategy 2: Water management, Target 17: Sufficient water for consumption, Strategy 47: Sustainable water management as assigned to Department of Water Resources, Department of Groundwater Resources, and Office of the Permanent Secretary of Ministry of Natural Resources and Environment as the driving agencies in Strategy 2. One of the projects operated by the Groundwater Development Fund, Department of Groundwater Resources, was the project to assess the use of groundwater in the entire product life cycle (Water Footprint). The project target group was industrial plants using groundwater in order to focus on the self-development of the industrial sector in terms of knowledge, personnel, technology, most efficient use of water resource, and guideline for maximum reduction of the use of water.

Based on the reviews and linkage of various plans, both at national and international levels, the issue of water resource can be seen as crucial and has been defined as a strategic issue. The review of the mentioned plans was used as a study guideline in accordance with national and international plans with the issue of water resource. This led to the assessment of the water footprint of hotels type 1 in Bangkok using water footprint tools based on international standards, namely HWMI, created

through the cooperation of ITP and the Water Footprint Network, which has been dissemination to hotels worldwide to maximize water use and be used as a guideline to reduce water consumption for the sustainability of water resources and the hotel industry.

4.2.2 Policies, Measures, Requirements, and Water Footprint of Hotels

Interviews were conducted with policy makers responsible for policy formulation. The informants included executives related to hotel business and the environment. The interview results consisted of the following:

1) Comments on policies, strategies, and action plans of hotels to support the environment

Each agency has the role of promoting business entities, both in the production and service sectors, such as hotels and hospitals, who recognize the environment in operating their businesses. The agencies provide knowledge about the environment and grant awards, using environmental issues as criteria. An interviewee stated, “Our agency has the policy to support products and services in the form of competition for Thailand tourism industry awards by using environmental management, energy, and climate change as the components to consider granting the awards.” This was in concordance with the two other interviewees who stated, “Our agency is responsible for promoting, providing knowledge, and conducting public relations on environment. Hotels are the target group of Green Hotel Project with awards bestowed on the hotels that passed the assessment. The other interviewee said, “Our agency is responsible for promoting the application of international standards and the application for certification to enhance competitiveness at the international level. Therefore, training, assessment, and certification are provided for business entities who comply with regulations, covering standards related to environmental management (ISO 14001), assessment of CO₂ emission (ISO14046), and assessment of water consumption (ISO 14064).”

2) Trend toward hotel business environmental conservation

Environmental issues are currently receiving more attention. At the same time, the dissemination of news and information, as well as public relations are becoming more accessible due to new technologies. The environment is a topic of interest and significance worldwide, especially the issue of global warming. Therefore, countries around the world have joined efforts in reduction of energy use, and are seeking solutions to environmental problems, including in agriculture, industry, goods and service businesses. Consequently, the trend toward environmental conservation in the hotel business has also received more attention. The hotels however placing importance on environment are mostly large hotels or foreign-affiliated hotels. As one interviewee said, “Hotels focusing on environment are mostly large hotels or foreign-affiliated hotels. The reason is perhaps the hotels are experienced in having foreign guests who are concerned with environment or it is the demand of hotel chain owners who wish to see their hotels with the same standards all over the world.” This was in concordance with the other interviewee who said, “During the initial phase of the operation of environmentally-friendly hotel project, the target groups defined by the agency were small- and medium-sized hotels. But large hotels were more interested. Perhaps because large hotels already have environmental conservation policy and personnel readiness in place.” Tourists with more concern for the environment were mostly from Europe.

3) Recognition and awareness of environmentally-friendly labels and awards such as Green Hotel, Green Leaf, Carbon footprint, and Water footprint

The interviewees made comments in the same direction that recognition and awareness of environmentally-friendly labels and rewards were still low, especially with small- and medium-sized hotels showing very little interest. As one interviewee said, “The top priority for small- and medium-sized hotels is economy not environment.” This was in accordance with the other interviewee who said, “There is little awareness on environment on the part of hotel business. Probably it is because environment is still viewed as something which is not urgent.”

4) Cooperation to operate environmental-friendly hotels and stimulate hotels to participate, especially hotels type 1

Some interviewees commented that hotels offered little cooperation to operate environmental-friendly hotels due to insufficient public relations benefits and knowledgeable personnel, and due to the relatively high operating budget. As for stimulating hotels type 1 to participate, there must be incentives. An interviewee said, “Incentives for hotels especially hotels type 1 to participate in environmentally-friendly hotel project may include annual income tax exemption for standard-certified hotels.” However, the reason that the hotels type 1 were not interested in participating in the environmentally-friendly hotel project was probably because the rewards presented by agencies might not benefit the hotels. The other interviewee said, “Hotels are quite cooperative with our agency because our agency conducts public relations in the area and provides knowledge to hotel employees to follow the project’s requirements. The hotels are also acquainted with benefits they will receive on participating in the project.”

5) Recognition of water footprint, significance of water footprint to hotel business, and activities or projects related to hotel’s internal water conservation

Most interviewees had not heard of water footprint before. However, after learning about it, they recognized its importance. With acquired knowledge, they would gain understanding and change their water consumption behavior. One informant already acquainted with water footprint said, “It is the standards that will help the hotel effectively control water management.” As for activities or projects related to internal water conservation, the hotel implements the activities to reuse treated water to water trees, project to reuse towels, and project to reduce the use of table cloths.

6) Guideline of sustainable water management for the hotel business

One informant said, “Thailand is abundant with water. But during the rainy season, there are floods but there is no guideline to keep it because sometimes there is also drought. There should be maximum water management. There should be direction to reserve large volume of water during the rainy season to be used in the dry season and there should be engineering system to reserve rainwater. The knowledge

should be transferred to hotels to reduce water costs by using the reserved water.” Another informant said, “The hotel places importance on information recording, so information recording on the use of water is continuously conducted so that the hotel knows of any irregular information, pointing to any irregularity such as water leakage or permeability or increased use of water.” The other informant said, “Water footprint standards should be implemented as devised.”

7) Opportunities and problems in applying water footprint to hotel business in the future

The positive factors in applying water footprint to hotel business in the future included users’ knowledge and understanding of water footprint, correct information collection, and raising awareness and placing importance on water resource, as well as promotion measures for motivation. In particular, the commitment and support of executives are an important factor to bring about successful water footprint implementation. The negative factors in applying water footprint included employees’ unreadiness in terms of knowledge, insufficient number of employees, and language problems in communication. As one informant said, “How to turn water footprint into a language which is easy to understand. Because understanding is the beginning of success.”

8) Guideline to drive, create incentives, and measures to apply water footprint to the hotel business

The driving guideline should be formulated as policy, strategies, and action plans of relevant agencies. The relevant agencies should formulate action plans and measures to apply water footprint to the hotel business and provide knowledge so that hotels become aware of the potential benefits of water footprint assessment. As one interviewee said, “Hotels should be made to know about the benefit of water footprint such as contribution to hotels’ cost reduction. Implicitly, hotels would focus on the issue.” This was in concordance with the other interviewee who said, “At present, the Department of Environmental Quality Promotion has developed online information to motivate hotels, not having joined the project, to know and start using the program to record the information on water and electricity bills so that hotels realize the benefit of recorded information for water and electricity management. Information, collected on

successful hotels, will serve as a good example of water management and motivate them to join the project.” Other incentive measures included tax exemptions, government funding such as training, assessment investigation for standard certification, and the creation and effective enforcement of laws.

The results of the interviews with policy makers revealed that agencies responsible for policy formulation devised policies to promote business entities both in manufacturing and service sectors based on environmental awareness. Currently, the world is interested in and focused on reduction of environmental impacts. However, in Thailand, recognition and awareness of environmentally-friendly labels and rewards have attracted little interest, especially small and medium hotels who have little interest in the environment. Large hotels or foreign-affiliated hotels place importance on environment, however, water footprint assessment and water footprint is not well known despite water footprint being important for water management. Public relations or knowledge transfer to hotel operators would enhance understanding and change behavior in terms of the use of water. The factors likely to lead to successful application of water footprint to hotels include the executives. The commitment and support of executives is crucial factors. Knowledge and understanding of water footprint transferred to operating employees, accurate information recording, awareness and recognition of the importance of water sources, as well as promotion measures to forge motivation are also critical. The factors that posed obstacles in applying water footprint to the hotel business are the unpreparedness of employees both in terms of knowledge and the number of employees, as well as language for communication which requires simple language for acknowledgement and understanding. As for the guideline to drive, motivate, and the measures to apply water footprint to the hotel business, responsible agencies should formulate action plans and take measures to apply water footprint and provide knowledge so that the hotels realize the benefit that they would receive from water footprint assessment and publicize the hotels which are successful as examples and inspiration for other hotels to join the project as well as devise other incentives such as tax deduction, and government funding to support the project.

4.3 Lessons Learned, Importance, Water Management in Award-Winning Green Hotels

Regarding the lessons learned, importance, and internal water management of awarded environmentally-friendly Green Hotels are important as they serve as examples of successful hotels in water management. The researcher conducted this part of the study because they wished to understand the information for the guideline of water management of Green Hotels. All these hotels were certified by the Department of Environmental Quality Promotion, guaranteeing that their water management was efficient. Based on the study findings of the lessons learned, importance, and efficient water management of Green Hotel, the researcher would make use of the information for consideration and adaptation to present the guideline of efficient water management of hotels type 1 in Bangkok. As for the criteria to select hotels for interviews and for information compilation, the researcher selected the hotels which were hotels type 1 in Bangkok that were included on the list of 2017 Green Hotel award-winning hotels.

The environmental-friendly hotel project (Green Hotel), operated by the Department of Environmental Quality Promotion, aimed to promote the potential of economical and efficient use of resources, good environmental management, upgrading standards of environmentally-friendly services, and preparing for assessment of environmental standards in concordance with international standards. Criterial and qualifications of the hotels interested in joining the project consisted of the following: (1) permit to operate hotel business according to the Hotel Act and not expired; and (2) not in the process of being accused or investigated or complained regarding the environment. The criteria to assess environmentally-friendly Green Hotels consisted of the following: (1) policy on environmentally-friendly service; (2) personnel development; (3) campaign to publicize environmentally-friendly service; (4) environmentally-friendly procurement; (5) environmental management and energy conservation; and (6) participation with locals and communities. The levels that passed the criteria included Gold with the scorers of 80 percent upward, Silver with the scores of 70-79 percent, and Bronze with the scores of 60-69 percent. The hotels that passed

the assessment criteria were awarded plaques and certificates for the duration of three years (Department of Environmental Quality Promotion, 2019)

The informants included general managers, quality managers, engineering managers, human resource managers. The researcher used the information acquired from the interviews to conduct an analysis of sustainable water management for hotels type 1. The interview results were as follows:

4.3.1 Hotel A

The informant said that currently the trend of environmental conservation was crucial to marketing and competition with other hotels. One aspect was image on environmental protection. “Our hotel’s main income comes from tour companies such as TUI Travel, Virgin Holidays which are huge markets in Europe or the US. Large companies sent questionnaire to the hotel to ask about its environmental protection activities. Award or certificate on environment is a must before tour companies send their customers. Without it, the companies will not send any customers.” Therefore, the hotel’s internal environmental operation was crucial. The hotel defined environmental policy as its indicators, by defining goals, and ensuring implementation by all employees. “Environment is one of the hotel’s training topics. Since day one, all employees must attend training on environment. They must continuously do so and undergo regular follow-up. Three departments would work together namely Quality Department, Training Department, and Public Relations Department. But in reality, everyone in the hotel joins hands. There are also rewards such as limited-edition shirts, or meal coupons for the employees.” The hotel also received support from the government such as through the Thailand Convention & Exhibition Bureau (TCEB) under Ministry of Tourism and Sports. TCEB renders support by publicizing the hotel in the world market and provides 70 percent funding to enable the hotel to implement the environmental standards, from providing for a consultant to assess the hotel’s feasibility and train the staff so that the hotel becomes a good quality hotel and is awarded with a certificate. All large hotels are members of TCEB. As for environmental providers in the private sector, there is little real support, rather the hotel pays for assistance. For example, Earth Check Australia, dealing in

environmental standards, inspects hotels according to environmental standards as stipulated. The factors enabling the hotel to implement the policy according to the required standards and receive the award include the hotel owner and good cooperation from all employees, partly due to knowledge and training to employees. Therefore, the guideline of sustainable water management must be instilled to raise awareness of the environment and use of water-saving technology. As for the hotel's internal activities on water conservation, the informant said, "The hotel's main water consumption is laundry. Therefore, the hotel brings the laundry water used in the final stage to be reused in the initial stage, saving water by 15 percent. The hotel's faucet is controlled by human foot and sensor. The urinals have the choice of low or high flow of water. The hotel also plans to modify guest rooms by taking out bathtubs as they consume a large amount of water and replacing them with standing showers. As for the wastewater, it is treated at the initial stage, separating sediment and fat, using EM, then discharging it."

As for the recommendations to encourage hotels type 1 to operate internal water conservation or join environmentally-friendly hotel project, the informant said, "The hotel owner must be the driver. Knowledge must be provided in the same direction. Law must be enforced and penalty may be used by not extending hotel business permit if there is non-compliance. The government must also support funding. As hotel is a kind of business, the return must be in monetary form. For example, what will the hotel gain in return by reducing water consumption. If there is no return, there is no point in doing because this is business. Reduced electricity consumption will gain discount in return. But there is no compensation at all for the reduced water supply use."

On water footprint, the informant said, "The hotel knows about water footprint and realizes its importance. If water footprint reduces, it means reduced costs. Benefit would increase and the hotel employees would benefit from the increased profit. But water footprint must be better known. There is no host agency of water footprint. It could be Metropolitan Waterworks Authority or Ministry of Energy. Ministry of Energy should not supervise only electricity because water is energy as well." Regarding the positive and negative factors in applying water footprint to hotel business in the future, the informant said, "The success factors include cooperation from

everyone, not only employees but hotel guests as well, forge correct understanding for everyone on the meaning of water footprint. The knowledge should not be among a small group of employees such as in maintenance or environment departments. Waiters or housekeepers will be left off. The problem factors include very little public relations and knowledge provided on the topic.”

4.3.2 Hotel B

The informant said that currently the hotel business places great importance on energy and environment, and economic and worthwhile use of resources to create sustainability. The hotel was conscious of environmentally-friendly labels and awards. “We start from environmental labels. At the hotel, we chose environmentally-friendly products such as paint, paper, cups and saucers, and other equipment, as stipulated by standards due to Earth Check’s regular inspection.”

The environmentally-friendly hotel award would enhance the hotel’s good image, directly impacting the number of service users. “Most of the hotel’s customers are from tour companies and government agencies who seek services of environmentally-friendly hotels. Prior to receiving the Green Hotel award, government agencies seeking our services asked us if we received the Green Hotel award. At that time, we did not so we were rejected. After receiving the award, many government agencies choose our services. It is a good thing. Because the hotel does a good thing and receives good things in return.” The hotel was supported by public and private agencies. “The hotel receives support by government agencies in choosing an environmentally-friendly hotel as a venue for meeting or seminar. The hotel also receives support from Electricity Generating Authority of Thailand by providing 20 percent funding to improve the hotel’s building in order to save electricity such as change into all LED lightbulbs and inviting the hotel’s employees to attend EGAT’s training. Moreover, the hotel receives support from TCEB under Ministry of Tourism and Sports by publicizing our hotel in the world market. The Laksi district office supports the hazardous waste collection. The officials, from the Green Hotel project who come for assessment, make suggestions to the hotel for standard improvement. As for the private sector, it is more cooperation between the public and the private sectors.”

On the hotel's internal implementation of environmental conservation, the hotel has a department directly dealing with the environment. The hotel's headquarters also has an environmental policy according to which the hotel group must submit monthly reports on the issue. The factors enabling the hotel to receive the environmentally-friendly hotel award included policy implementation by the headquarters, cooperation from all employees, and internal activities on water conservation. "We have modified ball float in the toilet from 10 liters to 8 liters, lowered flow of faucet and shower heads, modified the faucet so that air bubble flow is emitted, saving water. The next plan is to collect and reuse the hotel guests' unused drinking water to water trees. As for wastewater treatment, our hotel does not have it. Because wastewater from all hotel buildings will be treated in one location." Therefore, the guideline of sustainable water management includes all employees must being knowledgeable by providing them with information or training so that they can join in the implementation process. As for the recommendations to encourage hotels type 1 to operate internal water conservation or participate in the project, the informant said, "The law enforcement and the examples of successful hotels will show the hotels type 1 of the real benefits."

On water footprint, the informant said, "The hotel did not know about it before. However, according to study and research, the hotel thinks it is very important to hotel business. It would enable the hotel to know the exact use of water. At present, the hotel keeps a loose record of the information by dividing the total monthly water consumption by the number of rooms. Water footprint is new to Thailand. If it is the government's policy, the hotel is pleased to implement and support. On the success and problem factors in applying water footprint to hotel business in the future, the informant said, "The success factor is a human being. Everyone must understand and customers must cooperate. Technology must also efficiently save water. As for the problem factor, there is none. Everyone has the will to help and realizes the water shortage problems."

4.3.3 Hotel C

One informant said that currently the trend toward environmental conservation had increased. Hotels were aware and conscious of competition for awards

as they enhance their image which was crucial. Receiving an award not only reflects the responsibility toward the environment but also unity and cooperation from everyone in the hotel. It was also a factor that supported hotel business to reduce costs and increasing guests. Receiving an award would also be good public relations. In the past, hotels received little support for environmental conservation from either the public or private sectors. The support from the government was mostly for energy where only information and suggestions were provided, but not funding. As for support from the private sector, the hotel association rendered assistance on wastewater management by hiring a consultant company while absorbing all the consultant fees. However, the hotel must be responsible for its own investment and operating costs. Thus, hotels did not join the project because management deemed that the wastewater treatment for water reuse was not worth the investment and operating costs as the water bills in Bangkok Metropolitan were not high. Moreover, the hotel's water bills accounted for only 3 percent of the total electricity, fuel, and LPG costs.

However, the hotel implemented internal environmental conservation by devising a policy and action plan. The informant said, "Meeting attendance by all departments in the hotel to suggest ways to save water, leading to cooperation of employees is an important factor that helps the hotel to receive the award. The hotel organizes internal water conservation activities such as signs inside guest rooms notifying hotel guests to inform housekeepers if they want to change towels or bed sheets or not, rainwater tank provided to water trees, and wastewater treatment by adding air. The treated water will be used to water trees and not to be reused because the wastewater is not treated to the level that it can be reused. Instead, the rest of the treated wastewater will be discharged into public water sources. Bangkok Metropolitan Administration does not charge wastewater treatment fees from the hotel. As for the quality of the treated wastewater, the hotel hires an external company to make monthly inspection of the standards of the water quality. In the hotel, water-saving technology is also used such as censored faucets, toilets with the choice of high or low flows of water." The use of water-saving technology would contribute to sustainable water management.

On the recommendations to encourage hotels type 1 to implement internal water conservation or join the environmentally-friendly hotel project, the important factor was to provide information and make hotels aware of the benefit of joining the project, especially hotel owners. On water footprint, one informant said, “Hotels know a little about the topic and think that water footprint is not an immediate issue to deal with. I am sure that if you ask hotel guests, they will answer that they do not know as well and it is an unimportant issue for hotel business at present.” On the positive and negative factors in applying water footprint in the future, the informant said, “The success factors include acknowledgement and understanding. All hotels must be invited to attend a meeting to provide knowledge, and understanding, and raise awareness of its importance such as it can reduce hotels’ water supply bills by 5 percent, examples of implementing hotels with success. The problem is that there is no clear agency responsible for water, unlike electricity. People in general do not know about water footprint and our water supply bills are too low to invest. Therefore, this is the factor of why many hotels are not willing to invest in technology.”

4.3.4 Hotel D

The informant said that, at present, the hotel was increasingly aware of the environmental issues, was interested to learn more, and was ready to develop the business in parallel with the environment as it impacts the hotel’s image. The environmentally-friendly hotel award would make employees proud of their hotel and guests would see value and pay attention to the hotel’s environmental operation. Regarding the environmental operation of the hotel, support from external agencies, both public and private, remained little. The hotel would like the government sector to provide training to hotel business operators to be conscious of environmental conservation. One of the crucial factors leading to the hotel receiving the Green Hotel award was because the hotel owner placed importance and devised an environmental management policy based on the Green Hotel requirements and the executives seriously implemented the policy. The employees were also willing to implement the policy. Moreover, customers and people in the community cooperated well. The hotel organized activities on water conservation such as use of low flow shower heads, dual flush tank for toilets, and sensors for men’s toilets in the hotel guests’ bathrooms and

employees' restrooms. Therefore, knowledge of the amount of water used per hotel guest led to finding ways to reduce water consumption further, generating increased sustainable water management. Regarding the recommendations to encourage hotels type 1 to operate internal water conservation and participate in the project, the informant said that, "There should be control of construction design to prevent future modification or improvement, affecting budget, and rendering it inoperable. The government sector should also devise the guideline to assist the participating hotels through budget support or water-saving technology." On water footprint, the informant said, "Very few people know the meaning and detail of water footprint. In operating hotel business, water footprint has not yet been applied."

4.3.5 Hotel E

The informant said that the present trend of tourists was they were more interested in environmental conservation. Therefore companies, both local and international, were also becoming more interested and increased their public relations through various media on the issue. The hotel realized the importance of the image of environmentally-friendly hotel which could be promoted through marketing. Moreover, internal environmental management would benefit the hotel itself. Therefore, the hotel was interested in joining the Green Hotel project. The assessment under the project started when the hotel developed an environmental policy and the management team seriously implemented it. The hotel provided information to the employees and regularly held activities such as a campaign for employees to save water, a campaign for hotel guests to save water by reusing towels, reuse of treated water to water plants, and raise awareness of the environment to employees.

All employees participated and cooperated well. Regarding the guideline of sustainable water management, the hotel thought that the measures for efficient use of water and maximum efficiency of the use of water would generate sustainable use of water. On the guideline to encourage hotels type 1 to participate in the project, the informant said that hotels should be provided information about the benefit they could gain by joining it. On water footprint, the informant knew about it but not in detail. If there was a water footprint assessment project, the hotel would be

interested to join because of its importance. On the factors impacting success and problems in applying water footprint in the future, the informant thought that the executives and all employees must possess knowledge and understanding on water footprint.

4.3.6 Hotel F

The informant said that the hotel was aware of the environmental issue and the importance of the image of being an environmentally-friendly hotel. The fact that the hotel received the environmentally-friendly hotel award reflected the vision of the hotel owner and executives, and the full cooperation of the employees for implementation. The guests were also pleased to come and were willing to pay more for the services, with the guests indirectly taking part in environmental conservation. The hotel received support from the Ministry of Natural Resources and Environment and joined the Green Hotel project. The hotel set the goal to reduce water consumption to 3 percent a year. The hotel used a water dripping system and set the time for watering trees, regularly checked damage and leakage of water-usage equipment, chose water-saving equipment, reduced the amount of garbage by at least 3 percent a year, changed or added energy-saving equipment in the hotel 3 percent a year, and regularly campaigned and disseminated information on energy conservation to hotel guests and people in the surrounding community. The most important factor that resulting in the hotel receiving the award was the environmental policy, with both executives and employees cooperating in implementing the policy and Green Hotel's standards. The hotel guests also cooperated well. As for the water footprint, the informant knew about it and thought that the factor that affected both positively and negatively in applying water footprint in the future was responsible agencies and selection criteria of water footprint assessment.

4.3.7 Hotel G

The informants said that establishments paid more attention to the trend toward environmental conservation. The hotel realized and placed importance on their environmental impact. Therefore, it joined the Green Hotel project and passed the

assessment which brought pride to the employees. After receiving the award, the hotel has continually followed the requirements. The hotel campaigned by engaging executives and all employees in internal activities such as turning off electricity when not in use, garbage separation, economical use of water, use of water-saving equipment such as water tap with sensor system, water-saving water tap head, wastewater treatment by adding air, and reuse of treated water to water trees. The most important factor leading to the hotel receiving the award was cooperation of employees. The hotel provided information on the methods to save water and ensured employees understood the value of water. Regarding ways to encourage hotels type 1 to participate in the project, both public and private sectors should cooperate by providing incentives of operating budget and sending in officials to provide information on efficient operating procedures. As for water footprint, the management knew about it and thought that water management was important. In the future, if water footprint was used, the hotel would be interested in joining the project and would request the government sector to provide information on efficient operation.

The findings of the Green Hotel award-winning hotels (Hotels A-G) can be summarized as follows: Green Hotel hotels formulated policy on water conservation as part of their main policy; structure of duty and responsibility was clearly defined; all hotels stated that owners and executives were essential in successful implementation, including policy formulation, participation in policy implementation; knowledge of water conservation through training of new employees and annual training on environment with the topic of water conservation for old employees to raise the awareness in water conservation; all hotels used technology, water-saving equipment, and guidelines and had methods of water conservation such as the unfinished drinking water in hotel guest rooms be accumulated to water trees, installation of automatic equipment to control the time for watering trees, and most Green Hotels were interested in water footprint assessment for hotel business as part of the trend toward being environmentally-friendly. As this was the issue that most people placed importance on and took interest in, it would enhance the hotels' image and increase the number of service users as shown in Table 4.1.

Table 4.1 Summary of the Guideline of Water Resource Management Case Study of Environmentally-Friendly Hotels (Green Hotels) :
External Factors

Factors	Hotels						
	A	B	C	D	E	F	G
External Factors	✓	✓	✓	✓	✓	✓	✓
Water conservation policy/tourism policy (Politic)	“The hotel was supported by TCEB by providing advice and knowledge to enable the hotel to become quality tourist destination”	“Government agency TCEB of Ministry of Tourism and Sports supported budget on environmental operation and publicize the hotel in the world market”	“The support from the public and private sectors was little in terms of water, more in terms of energy”	“The hotel requires the public sector to provide training and implementation on water conservation”	“The public and private sectors supported training related to environment”	“Ministry of Natural Resources and Environment supported the operation of environmentally-friendly hotel”	“The public and private sectors supported funding in operating the environmental project according to policy, and providing knowledge to the hotel”

Factors	Hotels						
	A	B	C	D	E	F	G
External Factors	✓	✓	✓		✓	✓	
Tourism-based economy/growth of tourism business/growth of tourists (Economic)	“Currently, while competing with other hotels, the hotel must publicize the environmental award that it received in order to attract more tourists and hotel guests”	“The hotel has more guests thanks to the Green Hotel award that the hotel has received”	“Environmental conservation can be used to promote the hotel which contribute to more guests”		“The hotel’s image of environmental conservation would promote sales”	“Tourists are willing to pay more for environmentally-friendly hotels”	
(Social)	✓	✓					

Factors	Hotels						
	A	B	C	D	E	F	G
External Factors							
	“Clean hotel is a good hotel”	“The hotel uses products with environmental labels”					
	✓	✓	✓	✓	✓	✓	✓
(Technology)	“The use of water-saving technology is sustainable water management”	“The hotel is knowledgeable in technology from the government agency who provided the training and knowledge”	“The use of water-saving technology is a good thing but must be worth due to quite high costs of water-saving equipment”	“I think that the use of technology will really reduce water consumption”	“Find out information and methods to optimize the use of water”	“Add water-saving equipment in hotel”	“The use of technology is part of water and energy management”

Factors	Hotels						
	A	B	C	D	E	F	G
External Factors	✓	✓	✓	✓	✓	✓	✓
Situations of water resource/water footprint (Environment)	“I know water footprint and it is very important for the hotel. If water footprint reduces, costs will reduce as well”	“I have not heard of water footprint before. But after some study, I think it is very important for hotel business”	“I know a little and think that it is not an immediate concern”	“I know water footprint but in hotel business operation, there has been little use or not at all”	“I have heard of water footprint but I do not have detailed information of the project”	“I know water footprint and expect it to be a good thing”	“I know water footprint and I think it is very important in water management”
Laws (Legal)	✓	✓					
	“Use of law enforcement or penalty not to	“Law enforcement					

Factors	Hotels						
	A	B	C	D	E	F	G
External Factors	extend the hotel business operation permit”	for compliance”					

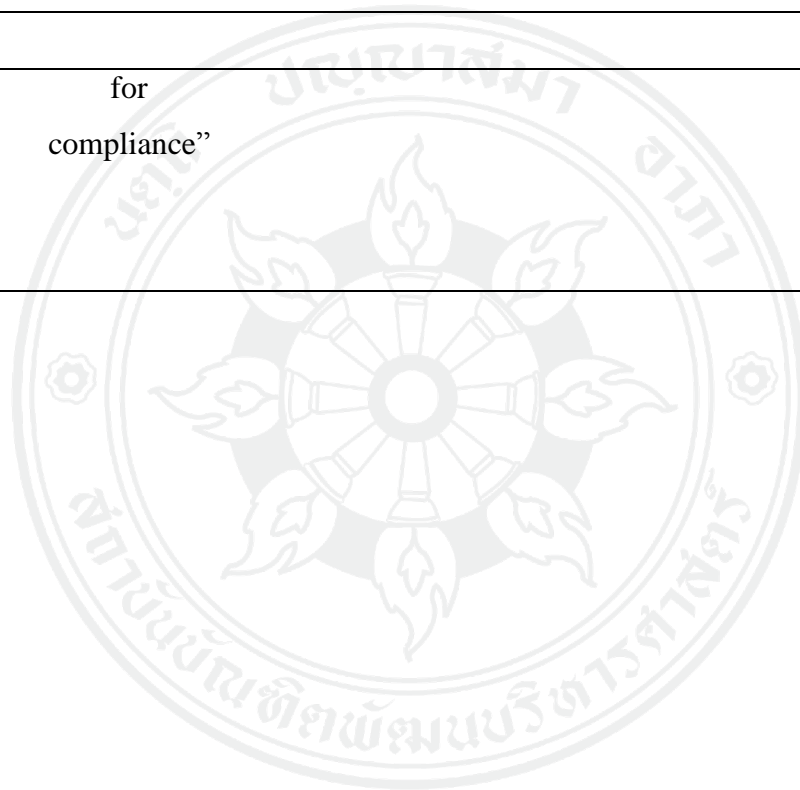


Table 4.2 Summary of the Guideline of Water Resource Management Case Study of Environmentally-Friendly Hotels (Green Hotels) : Internal Factors

Factors	Hotels						
	A	B	C	D	E	F	G
Internal Factors	✓	✓	✓	✓	✓	✓	✓
Water conservation policy (Strategy)	“The hotel as formulated environmental policy as indicator of the hotel and reward bestowed on the employees to motivate them”	“The hotel has environmental policy from its headquarters and all affiliated hotels must adhere to and submit monthly	“Announcement of guideline of water conservation in the hotel’s policy”	“The hotel has formulated environmental policy”	“The management places importance on policy and continuously supports environmental activities”	“Formulation of action plan to reduce consumption of water and electricity, and waste 3 percent a year, and add energy-saving	“Engage every employee and every department, as well as executives in the environmental project”

Factors	Hotels							
	A	B	C	D	E	F	G	
Internal Factors								
(Structure)	✓	performance report” “The hotel rewards its employees”	✓	✓	✓	equipment at least 3 percent a year”	✓	
Every hotel has devised the structure of the environmental working group according to the assessment criteria of environmentally-friendly Green Hotels								
Technology/equipment/activity (System)	✓	“The hotel uses water-saving equipment such as censored	“We have modified ball float in the toilet	“Use of censored faucet, Dual flush toilet,	“The hotel uses water-saving shower heads, Dual	“Campaign for employees to save water, use treated	“Use water dripping system, set the time for	“Use of water tap with sensor system,

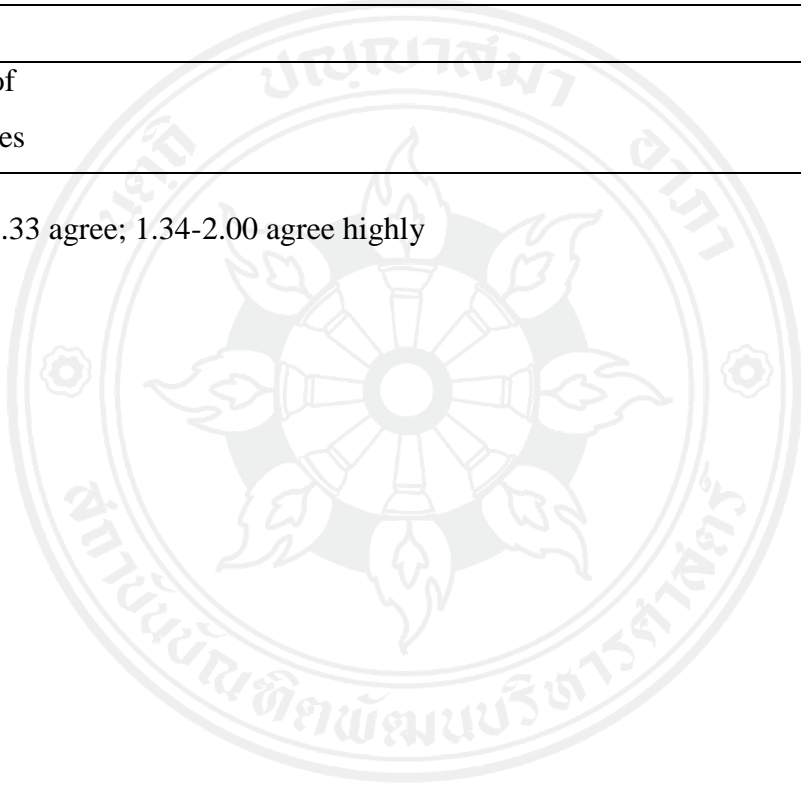
Factors	Hotels						
	A	B	C	D	E	F	G
Internal Factors	faucet, Dual flush toilet, and plans to switch from bath tub to more water-saving shower stand”	from 10 to 8 liters, lowered the flow rate of faucet and bidet shower, and modified the faucet so that air bubble flow is emitted, saving water. The next plan is to collect	reuse of treated wastewater to water trees, and signs in hotel rooms for guests to notify hotel maids if they wanted to change towels or bed sheets”	flush toilet, and censored urinals”	wastewater to water trees, and campaign for guests to reuse their towels”	watering trees, and choose water-saving equipment”	water-saving water tap head, activities for water-saving campaign, reuse of treated wastewater to water trees”

Factors	Hotels						
	A	B	C	D	E	F	G
Internal Factors							
Management style	✓	✓	✓	✓	✓	✓	✓
(Style)	“Every employee must attend training from day one, and continuous training. There will be follow-up and investigation”	and reuse the hotel guests’ unused drinking water to water trees” “Every employee must have the same knowledge so that they can help one another. So, the hotel	“Meetings of all departments in the hotel to recommend the water-saving methods”	“The hotel communicates with staying or visiting guests on its accomplishment of environmental conservation”	“Executive and all employees place importance and cooperate to make the hotel environmentally-friendly”	“Regular monitoring of water-using equipment”	“Provide understanding with every department in the hotel on the value of water”

Factors	Hotels						
	A	B	C	D	E	F	G
Internal Factors							
Employees (Staff)	<p>organizes training to provide knowledge to the employees”</p> <p>Every hotel had human resource department, determining the position in concordance with position, knowledge and</p>	✓	✓	✓	✓	✓	✓

Factors	Hotels						
	A	B	C	D	E	F	G
Internal Factors							
ability of employees							

Note: 0.00-0.66 agree low; 0.67-1.33 agree; 1.34-2.00 agree highly



4.4 Findings of Implementation of Environmental Management of Hotels Type 1 in Bangkok

There were 93 hotels type 1 in Bangkok registered with Department of Provincial Administration (as per July 11, 2018). Data was collected via 54 questionnaires, accounting for 58.06 percent.

4.4.1 General information

The general information of the hotels and the informants including hotel location, position, and work experience.

Table 4.3 General information

	General Information	Number	Percentage
Locations of hotels by district in Bangkok	Inner Bangkok	37	68.52
	Mid Bangkok	12	22.22
	Outer Bangkok	5	9.26
Positions of respondents to the questionnaires	Welcoming staff	28	51.85
	Maintenance staff	10	18.52
	Cleaning staff	6	11.11
	General staff	6	11.11
	Regular staff	2	3.70
	Manager	1	1.85
	Manager trainee	1	1.85

	10	3	5.56
	8	1	1.85
	7	2	3.70
	6	2	3.70
Experience of questionnaire respondents	5	9	16.67
(year)	4	3	5.56
	3	9	16.67
	2	14	25.93
	1	9	16.67
	N.A.	2	3.70

According to Table 4.3, of 54 hotels type 1 in Bangkok classified by districts, most were from inner-Bangkok at 68.52 percent, followed by mid-Bangkok at 22.22 percent, and outer-Bangkok at 9.26 percent.

The position of informants included welcoming staff at 51.85 percent, followed by maintenance staff at 18.52 percent, and managers and manager trainees at 1.85 percent.

Work experience included 2 years at 25.93 percent, followed by 5 years and 1 year at 16.67 percent, and 8 years at 1.85 percent.

4.4.2 As for the opinions on the external factors affecting the water and wastewater management of hotels type 1 in Bangkok, the findings are shown in Table 4.4

Table 4.4 Acquaintance with Water footprint

Water footprint	Number	Percentage
Acquainted with	2	3.70
Not acquainted with	52	96.30

As shown in Table 4.4, of 54 hotels, 52 hotels were not acquainted with water footprint, accounting for 96.30 percent; and 2 hotels were acquainted with water footprint, accounting for 3.70 percent.

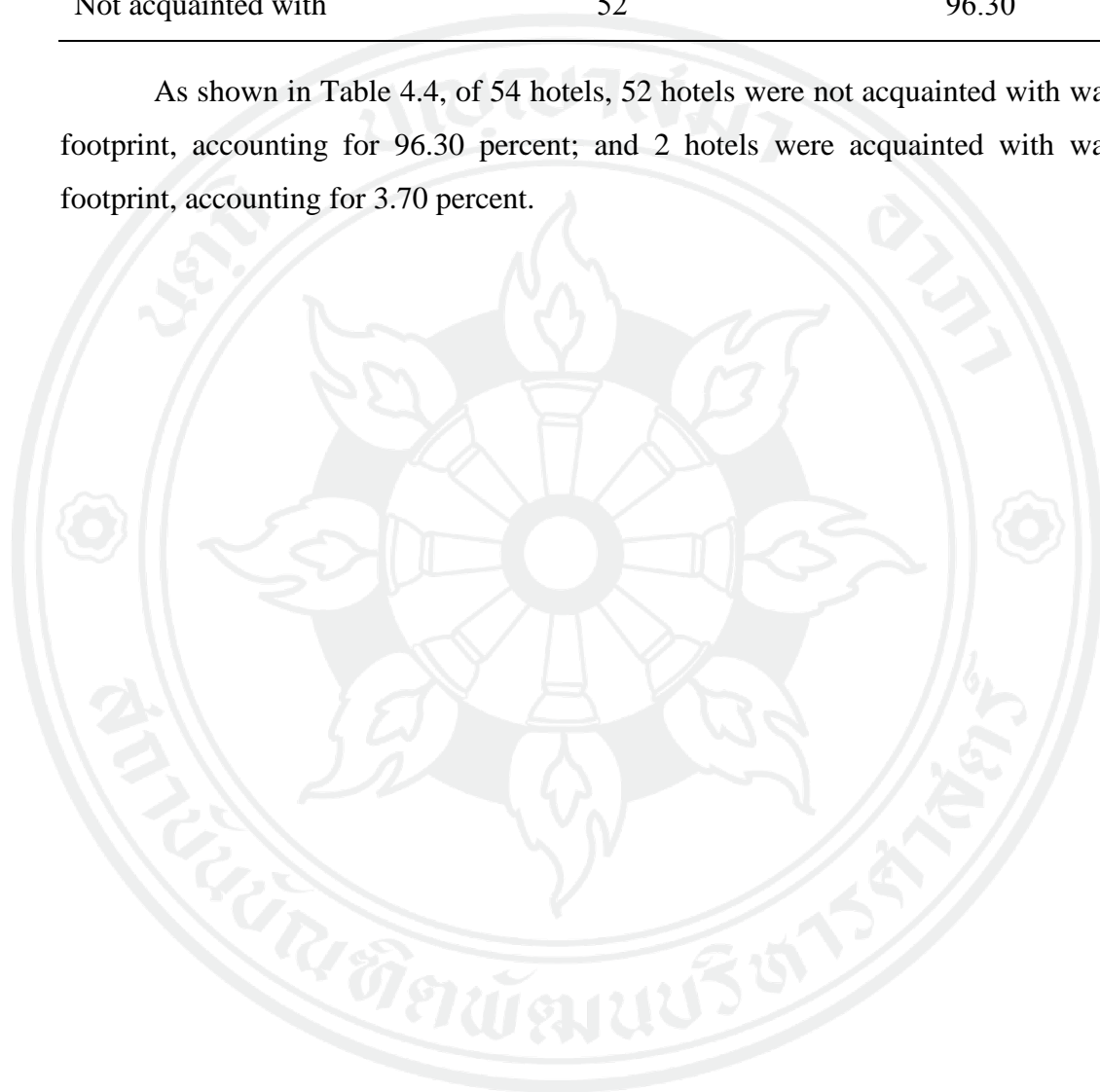


Table 4.5 Opinions on External Factors affecting Water Management in Hotels Type 1 in Bangkok

Items	Questions	Agreed		Uncertain		Disagreed		Average
		No.	%	No.	%	No.	%	
1	The government's policy and measures on tourism promotion will contribute to increased guests in your hotel	27	50.00	24	44.44	3	5.56	1.44
2	The government's policy and measures on promotion of water conservation such as water saving, reduction of water loss by starting from internal inspection of broken and leaked pipes will contribute to reduction of your hotel's water supply bills	34	62.96	18	33.33	2	3.7	1.59
3	Tourism-related economic situations and growth of tourism business result in increased number of hotel guests	42	77.78	11	20.37	1	1.85	1.76
4	Increased number of tourists affects increased water consumption	53	98.15	1	1.85	-	-	1.98
5	Use of water-saving equipment and tools in hotels can contribute to reducing water consumption and water supply bills	53	98.15	1	1.85	-	-	1.98

Items	Questions	Agreed		Uncertain		Disagreed		Average
		No.	%	No.	%	No.	%	
6	Water resource is crucial to hotel business	49	90.74	5	9.25	-	-	1.91
7	If there is the problem of the shortage of tap water in Bangkok, it will damage hotel business	43	79.63	11	20.37	-	-	1.80
8	Quality of tap water in Bangkok affects operation of hotel business	46	85.19	5	9.26	3	5.56	1.80
9	Safety from epidemics, water-related infectious diseases from consumption of tap water in Bangkok affect operation of hotel business	44	81.48	7	12.96	3	5.56	1.76
10	If there is water pollution in Bangkok, it will damage hotel business	40	74.07	10	18.52	4	7.41	1.67
11	If the government enacts law enforcing all hotels to conduct water footprint assessment	7	12.96	25	46.30	22	40.74	0.72
12	If the government has promotion measures by awarding the hotels that can reduce water consumption such as plaque, certificate, tax deduction	21	38.89	26	48.15	7	12.96	1.26
13	If your hotel participates in the water footprint project and receives the award, does it enhance your hotel's good image?	23	42.59	26	48.15	5	9.26	1.33

According to Table 4.5 on the opinions of external factors affecting water and wastewater management of 54 hotels type 1 in Bangkok, there were two issues that the hotels agreed most on at **98.15 percent**, namely the increased number of tourists affects the increased use of water and the use of water-saving equipment in the hotel can reduce water consumption and water supply bills; followed by **90.74 percent** with water resource is crucial to hotel business; and **12.96 percent** with the government should enact the law enforcing hotels to conduct water footprint assessment.

The issue with which most hotels disagreed, accounting for **40.74 percent**, was if the government enacts law enforcing all hotels to conduct water footprint assessment; followed by **12.96 percent** was if the government has promotion measures to award the hotels that can reduce water consumption such as plaque, certificate, tax deduction; and **1.85 percent** was the tourism-related economic situations and growth of tourism business result in increased number of guests in your hotel.

The two issues that most hotels were uncertain about, accounting for **48.15 percent**, were if the government has promotion measure to award the hotel that can reduce water consumption such as plaque, certificate, tax deduction, and if the hotel participates in the water footprint project and receives award, will it enhance the hotel's good image; followed by **46.30 percent** was if the government enacts law enforcing all hotels to conduct water footprint assessment; and the two issues, accounting for **1.85 percent**, were the increased amount of tourists affect increased water consumption and the use of water-saving equipment and tools in the hotel contributes to reduce water consumption and water supply bills.

The average of the opinions on external factors impacting water management of 54 hotels type 1 in Bangkok revealed that there were two issues that external factors made the most impact on water management or **average of 1.98** namely the increase number of tourists affected the increased use of water and water-saving equipment in hotels could reduce water consumption and water bills; followed by the **average of 1.91** namely water resource was crucial to hotel business; and the issue that had the least impact with **the average of 0.72** namely if the government passed the law to enforce all hotels to conduct water footprint assessment.

Note: The average would rank of the external factors impacting water management was based on agreed = 2, uncertain = 1, and disagreed = 0. The opinions of each column would be multiplied by the determined value and divided by the total sum.

Table 4.6 Study Findings of Water Management of Hotels Type 1 in Bangkok

Items	Questions	Yes		No		Average
		No.	%	No.	%	
1	Does your hotel have water conservation policy?	18	33.33	36	66.67	0.33
2	Does your hotel formulate water conservation strategies for hotel employees to implement?	21	38.89	33	61.11	0.39
3	Does your hotel organize internal activities for water conservation?	4	7.41	50	92.59	0.07
4	Does your hotel provide training on water conservation for employees or send employees to attend with external agencies?	2	3.70	52	96.30	0.04
5	Does your hotel award departments or employees with awareness of water conservation?	-	-	54	100.00	0.00
6	Does your hotel monitor, investigate, assess operation of each department or employee in the implementation of policy, action plan, or activities on water conservation?	2	3.70	52	96.30	0.04
7	Does your hotel use water-saving equipment or toilet?	37	68.52	17	31.48	0.10

Items	Questions	Yes		No		Average
		No.	%	No.	%	
8	Does your hotel conduct internal survey for broken or leaked pipes, damage, leakage of water-using equipment?	50	92.59	4	7.41	0.93
9	Does your hotel post labels, posters, or signs in hotel rooms or hotel vicinity for hotel guests and employees jointly preserve water?	26	48.15	28	51.85	0.48
10	Does your hotel reuse treated water for other activities?	3	5.56	51	94.44	0.10
11	Does your hotel treat water before discharge into public water sources?	35	64.80	19	35.20	0.65

According to Table 4.6 on the internal factors of water and wastewater treatment of 54 hotels type 1, hotels with most implementation constituting **92.59 percent** were hotels which conducted internal survey of broken, leaked pipes, damage, and leakage of equipment. The hotels additionally commented that the highest frequency for the internal survey of broken, leaked pipes, damage, leakage of equipment was every month, followed by every week, and every day. This was followed by **68.52 percent** of hotels who replied that they used water-saving equipment with toilets. With **3.70 percent** of hotels, there were two issues namely the hotels provided training on water conservation to employees or sent employees to attend training with external agencies and the hotels monitored, investigated, and assessed work performance of each unit or each employee in the implementation of policy, action plan, or activities on water conservation as determined by the hotels.

The issue least implemented by the hotels constituting **100 percent** on bestowing awards to departments or employees with awareness of water conservation; followed by **96.30 percent** on providing training on water conservation to employees

or sending employees to attend training with external agencies and monitoring, investigating, assessing each department or each employee in the implementation of policy, action plan, or activities on water conservation as determined by hotels; and **7.41 percent** was on internal survey of broken, leaked pipes, damage, and leakage of water-using equipment.

According to the study of additional informants, most water-saving equipment such as urinals, water taps, shower heads would be inspected by maintenance employee for damage or leakage of the equipment. Most inspections would be conducted on a monthly basis. Signs were mostly posted within hotels to notify guests to turn off water when not in use, no change of towels, and no change of bed sheets as part of the campaign for the economical use of water. Hotels also used finished wastewater treatment tank, grease trap tank, and drain grates in the initial wastewater treatment.

Table 4.7 Opinions on Hotels' Internal Water Management

Items	Questions	Yes		No		Average
		No.	%	No.	%	
1	Your hotel assigns duty to employees that matches their position, knowledge, and ability	53	98.15	1	1.85	0.98
2	Employees in your hotel recognize the importance of water resource	52	96.30	2	3.70	0.96
3	Employees in your hotel cooperate in hotel's internal water conservation	48	88.89	6	11.11	0.89
4	In the past, operation of your hotel business never experienced problems of tap water	22	40.74	32	59.26	0.41

Items	Questions	Yes		No		Average
		No.	%	No.	%	
5	In the past, operation of your hotel business never experienced problems of water pollution	52	96.30	2	3.70	0.96

According to Table 4.7 on water and wastewater management of 54 hotels type 1 in Bangkok, most or **98.15 percent** answered “Yes” with hotel assigning duty to employees that match their position, knowledge, and ability; followed by **96.30** percent with hotel employees realized the importance of water resource and, in the past, operation of hotel business did not encounter problems of water pollution; and **40.74** percent with, in the past, operation of hotel business never experienced problems of tap water shortage.

Most hotels with **59.26 percent** said “No” as in the past operation of hotel business never experienced the problem of pipe water shortage; followed by **11.11 percent** with hotel employees cooperated in hotel’s internal water conservation; and **1.85 percent** with hotel assigning duty to employees that match their position, knowledge, and ability.

The Tables 4.6 and 4.7 show that the issue most implemented with **the average of 0.98** was hotels assigned work to employees in accordance with position, knowledge, and ability of the employees; followed by **the average of 0.96** with two issues namely hotel employees realized the importance of water source and in the past, and hotel operation had never encountered any problems of water pollution; and the least implemented issue with **the average of 0.00** was reward to department or employee.

Note: The average ranked external factors by determining yes = 1 and no = 0. The number of the opinions in each column was multiplied by the determined value and divided by the total sum.

Table 4.8 Opinions on the topic that water footprint assessment can help hotel business save water and water supply bills

Questions	Agreed		Uncertain		Disagreed	
	No.	%	No.	%	No.	%
You think that water footprint assessment can help hotel business save water and water supply bills	10	18.52	38	70.37	6	11.11

According to Table 4.8 of 54 hotels type 1 in Bangkok asking whether water footprint assessment could help hotels save water and reduce water supply bills, **70.37 percent** of hotels expressed uncertainty, followed by **18.52 percent** agreed, and **11.11 percent** disagreed.

Table 4.9 Interest in Participating in Water Footprint Assessment Project

Questions	Interested		Not Interested	
	No.	%	No.	%
If the public or private sector provides knowledge and invites your hotel to participate in the water footprint assessment project, are you interested to join?	26	48.15	28	51.85

According to Table 4.9, of 54 hotels with the public or private sector providing knowledge and inviting hotels to participate in water footprint assessment project, **51.85 percent** expressed that they were not interested and **48.15 percent** expressed interest. They gave additional comments that the factors for hotels to take interest in joining the water footprint assessment project were the following: (1) reduction of volume of water consumption and water bills; (2) hotel's good image; (3) incentives from the government such as tax deduction on request for extension of hotel business operation

permit; (4) contribution to conservation of water resource; and (5) increased number of hotel guests.

4.5 Water Footprint Assessment of Hotels Type 1

The information obtained from the questionnaire would be used to assess the water footprint through the calculation of HWMI Methodology according to the following process:

4.5.1 The volume of tap water consumption in hotels in 2017

Information for water footprint assessment included the volume of tap water consumption in hotels between 2013-2017, as shown in Table 4.10, and volume of tap water consumption of hotels in 2017, as shown in Table 4.11.

Table 4.10 Volume of tap water consumption 2013-2017 calculated to find the average (yearly)

Ranks of hotels	Volume of tap water consumption (yearly)					Average Cubic meters/year
	Unit: Cubic meters					
	2013	2014	2015	2016	2017	
1	12,550	17,143	13,564	14,214	12,572	14,008.60
2	7,844	4,090	4,642	3,304	2,951	4,566.20
3	3,860	2,698	5,510	3,458	2,571	3,619.40
4	12,760	12,874	11,230	11,450	6,524	10,967.60
5	19,968	19,470	17,284	17,238	8,826	16,557.20
6	2,920	3,196	4,626	4,562	1,463	3,353.40
7	10,066	7,744	7,778	5,942	2,746	6,855.20
8	8,628	13,198	9,840	9,988	4,313	9,193.40

Ranks of hotels	Volume of tap water consumption (yearly)					Average Cubic meters/year
	Unit: Cubic meters					
	2013	2014	2015	2016	2017	
9	3,026	3,301	3,126	3,297	1,648	2,879.60
10	7,119	5,985	6,506	3,281	846	4,747.40
11	11,715	10,732	11,378	11,070	11,201	11,219.20
12	4,077	4,046	5,953	6,834	10,626	6,307.20
13	12,456	10,616	11,754	15,796	10,359	12,196.20
14	2,304	2,046	2,759	2,456	2,526	2,418.20
15	-	-	-	611	3,685	2,148.00
16	-	-	13,090	15,174	8,402	12,222.00
17	-	-	-	909	6,990	3,949.50
18	-	-	-	316	761	538.50
19	-	-	-	1,494	4,276	2,885.00

Note: As the data collection via questionnaire in part 2 on the volume of tap water consumption of hotels, no informants provided complete information, nor did they know or could reveal the information. Therefore, the researcher approached the Metropolitan Waterworks Authority for information on the volume of tap water consumption of the 93 hotels type 1 in Bangkok. The information was used for water footprint assessment of the total of 19 hotels, due to the discrepancy between the name used in hotel business operation and the name registered for the use of tap water, and information was received from some hotels which did not have the information that dated back five years because they had not been in operation for five years. This study selected information on the volume of tap water consumption in 2017 only for calculation as it was complete and reliable.

Table 4.11 Volume of tap water consumption of hotels in 2017

Ranks of hotels	Volume of tap water consumption (yearly)
	Unit: Cubic meters (m ³) 2017
1	12,572
2	2,951
3	2,571
4	6,524
5	8,826
6	1,463
7	2,746
8	4,313
9	1,648
10	846
11	11,201
12	10,626
13	10,359
14	2,526
15	3,685
16	8,402
17	6,990
18	761
19	4,276

4.5.2 Water Footprint Assessment of Hotels Type 1 in Bangkok

The researcher compiled information from 19 hotels according to the list of the hotels that received the information on the volume of tap water use from Metropolitan Waterworks Authority. The researchers compiled the information using questionnaires with informants. The obtained data to be used in water footprint assessment included hotel space, rented space, number of hotel rooms, number of hotel guests (yearly).

Based on the volume of the tap water consumption of hotels type 1 as shown under 4.5.1, the information would be calculated to find the water footprint according to the process of HWMI Methodology, starting by apportionment of tap water as shown in Figure 4.3, including total use of water (A); guest room use (B); and total guest rooms use (D).

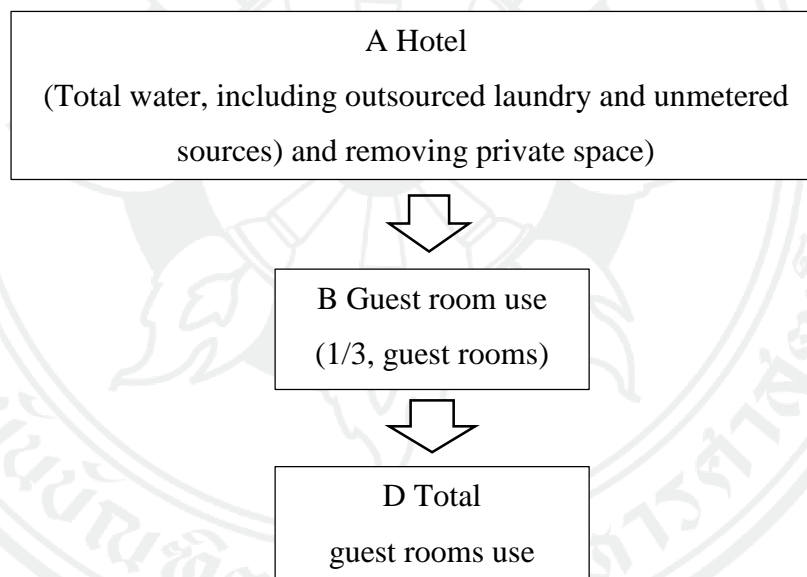


Figure 4.3 Water Withdrawal Apportionment

Source: The International Tourism Partnership (ITP) (2016a)

According to Figure 4.3, water withdrawal apportionment showed the division of the total consumption of water in the hotel in order to use the information for calculation.

As the area in this study was Bangkok with the total consumption of tap water, there was no information on the use of irrigated water or underground water. Water

footprint would be conducted using total water use obtained from water source consisting of metered municipal (mains) water, outsourced laundry, and private space. Therefore, the calculation of water footprint of hotels type 1 in Bangkok was as follows:

$$\text{Total per guest (per night)} = \frac{\text{Total water of guest rooms use (D)}}{\text{Total number of guests (per year)}}$$

The result was the water consumption of one guest room/night in cubic meter. The results of water footprint assessment are shown in Table 4.12.

Table 4.12 Results of Water Footprint Assessment of 19 Hotels Type 1 in Bangkok

Rank of hotel	Total guest room use (m ³)	Total number of guest (year)	Water footprint	
			Total per guest (per night) m ³	L
1	12,572	8,000	1.57	1571.50
2	2,951	4,000	0.74	737.75
3	2,571	10,000	0.26	257.10
4	6,524	18,000	0.36	362.44
5	8,826	8,600	1.03	1026.28
6	1,463	12,060	0.12	121.31
7	2,746	4,000	0.69	686.50
8	4,313	5,000	0.86	862.60
9	1,648	4,800	0.34	343.33
10	846	7,600	0.11	111.32
11	11,201	4,650	2.41	2408.82
12	10,626	5,250	2.02	2024.00
13*	10,359 + 146 (7.30 tones*20 m ³)	8,000	1.31	1314.38
14	2,526	9,500	0.27	265.89
15	3,685	8,000	0.46	460.63
16	8,402	7,800	1.08	1077.18
17*	6,990 + 260.8 (13.04 tones*20 m ³)	7,500	0.97	966.77
18	761	3,280	0.23	232.01
19	4,276	8,000	0.53	534.50

Note: * Hotel 13 and 17 outsourced laundry services. The volume of water must be calculated to combine with the volume of tap water to obtain the total use of water according to the HWMI Methodology which stated that, “Where the total water used is not available from the supplier, the total water can be calculated based on an assumption

that 20,000 L (20 m³) of water is used to wash 1 tone of laundry.” Hotel 3, 9, 15, and 18 had areas for rent within hotels which do not have a submeter reading which affects the volume of tap water and water footprint. All other hotels provided guest room services only.

According to Table 4.11, the benchmark for freshwater use in guest room in hotels was good = 300, fair = 300-350, poor = greater than 350 (liters per guest night) (The International Business Leaders Forum’s Tourism Partnership, n.d.) The findings revealed that 5 hotels accounting for 38.46 percent was good; 1 hotel accounting for 5.26 percent was fair; and 13 hotels accounting for 68.42 percent was poor. With 13 of the 19 hotels being poor, it is therefore crucial to accelerate the guideline of water management to reduce water footprint.

4.6 Guideline of Water Management of Hotels Type 1 and Water Footprint Assessment

This study reviewed the concepts, theories from PESTEL Analysis and McKinsey 7S Model to develop conceptual framework, indicators, and tools for the study. The results of the assessment of conceptual framework and indicators by experts revealed that the conceptual framework and indicators were suitable for the study. The conceptual framework and indicators were then developed into tools for the study. The researcher conducted the study of policy, measures, regulations, and water footprint of hotels type 1 using PESTEL Analysis to learn about external factors impacting water management through interviews with policy makers. It was found that small- and medium-sized hotels took little interest in the environment. However, large hotels or foreign-affiliated hotels placed importance on the issue.

The water footprint assessment was not yet widespread. Public relations or information provided to hotel operators would enhance understanding and change of behavior with the use of water. Hotel owners and executives were the most important factor for the application of water footprint. Operators should have knowledge and understanding of water footprint, correct information recording, and realize the importance of water sources. The obstacles to applying water footprint consisted in

employees' unpreparedness including lack of knowledge and insufficient number of employees. Therefore, relevant agencies should formulate action plans and measures to apply water footprint and provide information to the hotels so that they realize the benefit they would receive from water footprint assessment and publicize successful hotels as examples and motivation for other hotels to join the project and determine other incentives such as tax deduction, and government funding to operate the project.

Regarding lessons learned, importance, and water management of hotels with environmentally-friendly awards (Green Hotel), McKinsey 7S Model was used to know the guideline. As for the hotels passing the standard criteria of the Department of Environmental Quality Promotion through interviews with informants, it was found that all hotels with Green Hotel awards devised water a conservation policy as a central part of their overall policy and made announcement to employees for acknowledgement. The structure of duties and responsibilities was stated in clear written form. As for the environmental policy implementation, hotel owners and executives were crucial for success, including policy making, participation in policy implementation with employees, providing knowledge on water conservation through annual trainings for new and old employees in order to raise their awareness of water conservation.

All hotels had guideline and methods of water conservation and used water-saving technology and equipment. Most hotels with Green Hotel awards took interest in water footprint assessment with similar opinions regarding environment and environmentally-friendly hotels. They understood that they were the topics that most people were interested in, which would enhance the hotels' image and increase the number of service users, as well as increase readiness to meet the trend toward environmentally-friendly hotels. The questionnaires revealed that the issue most implemented by hotels type 1 was that the hotels assigned duty to employees in accordance with position, knowledge, and ability of employees, followed by two topics namely hotel employees realized the importance of water resource and in the past hotel business never experienced the problems of water pollution. The topic that all hotels type 1 did not implement was rewards to employees. More than half of hotels type 1

were not sure if water footprint assessment would help the hotels really reduce water consumption and water bills.

The results of water footprint assessment of 19 hotels type 1 in Bangkok, conducted according to the HWMI Methodology, revealed that more than half had a poor water footprint (volume of the use of water of 1 person/night) according to the benchmark for fresh water use in guest room in hotels of The International Business Leaders Forum's Tourism Partnership.

All the results of the study served as data leading to recommendation of guideline of water management of hotels type 1. The findings of the study of external factors from policy makers who were representatives of agencies related to the hotel business and the environment recommended the implementing guideline as summarize in Table 4.13. As for the findings of the study of internal factors for the guideline of water management of hotels with environmentally-friendly awards (Green Hotel) and the findings of the study of the guideline of water management of hotels type 1 in Bangkok, the researcher compared the two groups and recommended the implementing guideline for hotels type 1 in Bangkok as summarized in Table 4.14 and Figure 4.4.

Table 4.13 Findings of the analysis of external factors, information as obtained from policy makers

External factors	Findings from policy makers informants and representatives of agencies related to hotel business and environment	Implementing guideline
P (Politic)	Agencies responsible for promotion of hotel business and environment formulated policy on environment by providing knowledge on environment and bestowing awards by organizing activities in the form of project, engaging hotels to join the project	To promote water footprint assessment of hotel business, the government sector must assign a main agency especially responsible for water footprint such as Thailand Greenhouse Gas Management Organization (Public Organization) and Ministry of Natural Resources and Environment charged with carbon footprint, development and promotion of project and market for greenhouse gas, certification of project or registration of project, permission to use marks on the registration of external assessor for voluntary project or external assessor to apply for certified marks, IT center on greenhouse gas, support of the assessment to reduce greenhouse gas emission, promotion and development of potentials, advice given to private and public agencies on greenhouse gas management, and dissemination and public relations on greenhouse gas management, promotion and support of operation on climate change (Thailand Greenhouse Gas Management Organization (Public Organization) n.d.)

External factors	Findings from policy makers informants and representatives of agencies related to hotel business and environment	Implementing guideline
E (Economic)	<p>Currently, tourists and hotel business were more interested in environment, due to news, public relations, and more convenient dissemination of information. Environment was an issue that the whole world was interested in. Hotel business took interest in environmental conservation as well. Therefore, environment was part of decision of service users, directly impacting the hotels in terms of the number of hotel users. Mostly, hotels focusing on environment were large hotels or foreign-affiliated hotels</p>	<p>Thailand must be prepared to meet the trend of environmentally-friendly hotels. At present, tourists, especially European tourists chose tourist destinations, and accommodations, taking into account environmental conservation. Therefore, the government must promote the growth of hotel business in parallel with environmental conservation, in view of sustainable hotel business and environment. The government must devise promotion guideline, and public relations to hotel business operators to understand that environmentally-friendly hotels would increase the number of service users</p>
S (Social)	<p>Recognition and awareness of hotels with environmentally-friendly hotels were still low with little cooperation. Small- and medium-sized hotels, in particular, paid very little</p>	<p>Widespread public relations to hotels by organizing meetings or seminars, and inviting hotel business operators for sessions of explanation to learn about the importance and benefit of joining the environmentally-friendly hotel project</p>

External factors	Findings from policy makers informants and representatives of agencies related to hotel business and environment	Implementing guideline
T (Technology)	<p>interest. Their priority was more on economic situations rather than environment</p> <p>Water-saving equipment, guideline of sustainable water management for hotel business</p>	<p>Present or publicize new water-saving equipment or water-preserving methods to hotels, budget support for hotels to switch to water-saving equipment. If the government wished to encourage hotels to switch to water-saving equipment, it should enforce to the costs of water-saving equipment not to be high as the main limitation for hotels type 1 was budget</p>
E (Environment)	<p>Water footprint was one environmental tool that could enable efficient water management if knowledge was provided for understanding and implementation that could change behavior of water use</p>	<p>Knowledge, understanding, and correct implementation provided to prepare employees and concrete proof to show to the hotels that water footprint assessment could really reduce water bills. Examples might include project of successful model hotels from water footprint assessment, really benefitting the hotels, really reducing the hotels' water bills, and asking the model hotels to act as coaches for hotels interested in joining the water footprint assessment project</p>
L (Legal)	<p>Measures applying water footprint to hotel business should really benefit the hotels,</p>	<p>Determine promotional measures to motivate hotels type 1 to join water footprint assessment such as tax deduction, reduction of fees to apply for</p>

External factors	Findings from policy makers informants and representatives of agencies related to hotel business and environment	Implementing guideline
	motivating them to join the project. Rewards by various agencies granted to the hotels might not interest them in terms of benefit	extension of hotel business operation permit. If hotels joined the water footprint assessment project and passed the set standard criteria, the government sector should further assist the hotels by publicizing them, enhancing their reputation as hotels with awareness of water source, increasing the opportunity to be selected to use the service, having direct impact on income, and not ending the operation of the project with rewards, which the hotels might not see the benefit

Table 4.14 Findings of internal factors for the guideline of internal water management of hotels with environmentally-friendly awards (Green Hotel) and the guideline of water management of hotels type 1 in Bangkok

Internal factors	Study findings of the guideline of internal water management of hotels granted environmentally-friendly awards (Green Hotel)	Study findings of the guideline of water management of hotels type 1 in Bangkok	Implementing guideline
Strategy	Water conservation policy was devised as part of the hotels' main policy	Mostly, there was no devised water conservation policy within hotels	Operation was mostly controlled by hotel owners. Therefore, hotel owners had the fullest right of decision-making. They must have commitment, intention, and formulate water conservation policy as part of the hotels' main policy
Structure	Devised structure of environmental working group	In some hotels, employees must operate many duties such as in one hotel, the manager had to work as maintenance employee as well	Definition of the structure of position, duty, detail of operation in concordance with each position in written form for clarity and announcing the information to all employees so that they knew their duty and responsibility and worked to their utmost ability

Internal factors	Study findings of the guideline of internal water management of hotels granted environmentally-friendly awards (Green Hotel)	Study findings of the guideline of water management of hotels type 1 in Bangkok	Implementing guideline
System	Use of water-saving technology and equipment and water-saving methods Campaign to engage both employees and hotel guests to cooperate in water-saving activities such as posters or labels	Mostly, there was only the use of water-saving equipment Mostly, there was internal activity on water conservation	Change into water-saving equipment. Hotels with limited budget could adjust the slower rate of water flow, reduce water use in urinals in order to reduce the water consumption per one flush Poster or label posted for water-saving campaign in hotel rooms, offices, and common areas
Style	Regular monitoring and investigation of leakage of equipment and various areas within hotels	Mostly, there was regular monitoring and investigation of leakage and damage of water-using equipment. But mostly,	Regular information recording is determined such as water bills, number of hotel guests, monitoring of damage or leakage of water-using equipment to serve as information to reduce water consumption, and monitoring of employees'

Internal factors	Study findings of the guideline of internal water management of hotels granted environmentally-friendly awards (Green Hotel)	Study findings of the guideline of water management of hotels type 1 in Bangkok	Implementing guideline
Various activities held and rewards to employees to promote cooperation in water conservation from employees and reward to inspire the employees such as slogan contest on water conservation	there was no monitoring and investigation of employees' implementation All hotels did not reward employees	implementation in concordance with the hotels' water conservation policy	Organize activities or monitor and inspect employees' operation. If the employees managed to reach the goal, rewards should be granted to inspire them to continue the work and motivate them to work even better

Internal factors	Study findings of the guideline of internal water management of hotels granted environmentally-friendly awards (Green Hotel)	Study findings of the guideline of water management of hotels type 1 in Bangkok	Implementing guideline
Staff	Written assignment of duty and responsibility in concordance with position	Most duty is assigned according to employees' knowledge and ability	Assignment of position in accordance with knowledge, and ability of employees to forge unity of teamwork such as all employees took interest in finding damage or leakage of water-using equipment and not leaving it to the duty of maintenance employees
Skill	Training provided on water conservation which was part of training for new employees and training continuously provided for old employees	Mostly, there was no training on water conservation for employees	Internal training for new employees to learn about the hotels' water footprint policy and measures in order to work in accordance with the policy and the measures. Annual training should be provided to old employees in order to be regularly aware of water conservation. Employees should also be sent for external training to enhance knowledge, ability and development of employees according to their

Internal factors	Study findings of the guideline of internal water management of hotels granted environmentally-friendly awards (Green Hotel)	Study findings of the guideline of water management of hotels type 1 in Bangkok	Implementing guideline
Shared Value	Employees cooperated in implementation leading the hotels' goal of passing the assessment of environmentally-friendly Green Hotel project	Most employees were aware of the importance of water source and cooperative in water conservation within hotels	individual expertise such as maintenance employees assigned to participate in external training or visit in projects relating to technology, equipment, or other methods in water conservation. Raise awareness and conscience of economical use of water, and hotel owners' participation in implementation to set good example to employees

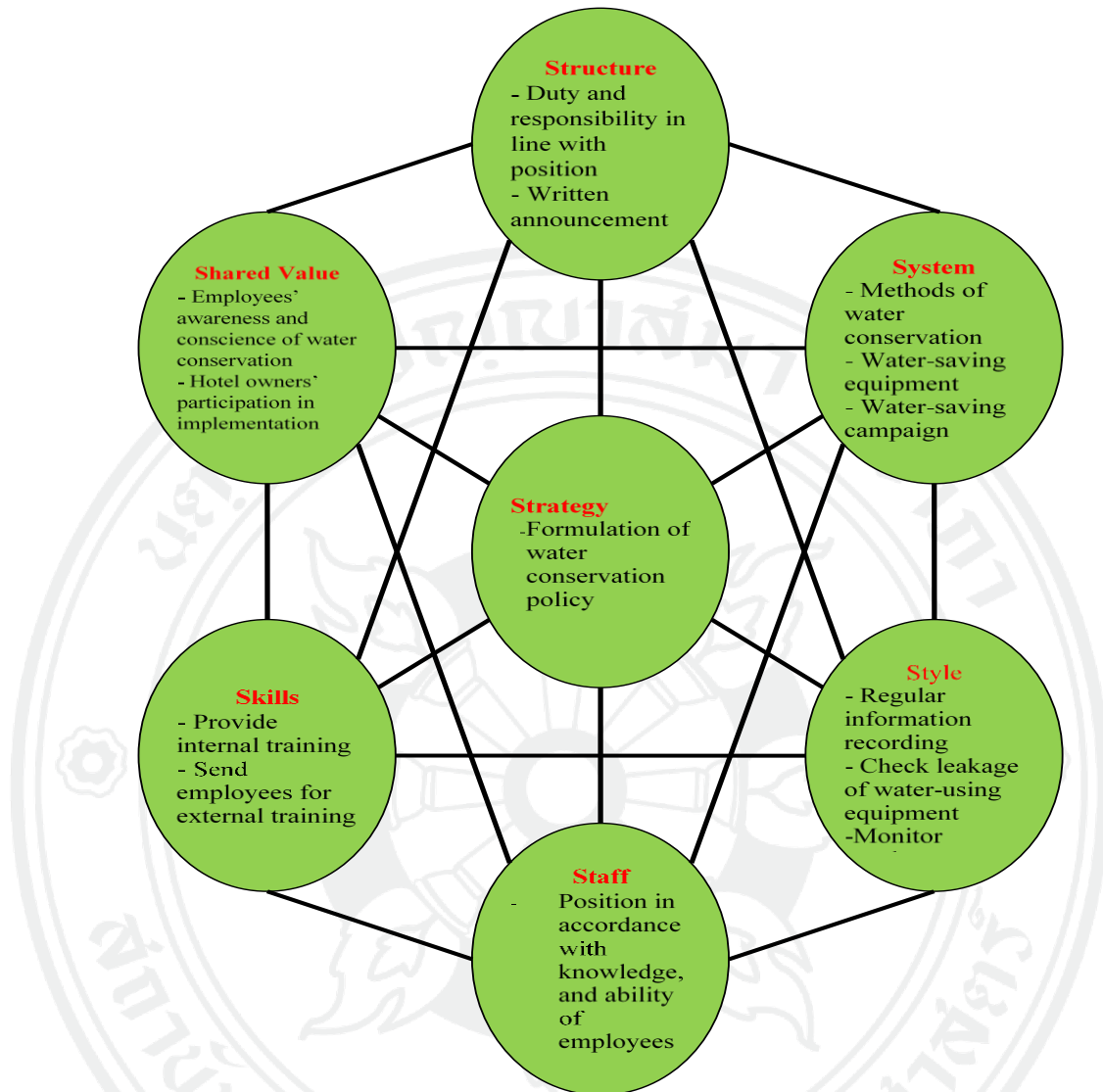


Figure 4.4 Guideline of water management of hotels type 1

According to Figure 4.4, McKinsey 7S Model showed the guideline of water management of hotels type 1 in Bangkok with the summary of each issue as follows:

1) Strategy: the most important factor leading to success in environmentally-friendly Green Hotel project was the formulation of water conservation policy as part of the overall hotel policy platform to serve as a common implementation guideline for employees.

2) Structure: By determining the structure of position, duty, detail of operation in concordance with the knowledge and ability of each position in written form for clarity and announcing the information to all employees so that they know their duties and responsibilities.

3) System: By devising the water conservation implementation, installation or change to water-saving equipment such as modification to slow down the rate of the flow of water and installation of posters in hotel guest rooms and employee rooms in visible and readable locations to raise water-saving awareness as part of a water-saving campaign.

4) Style: By devising and implementing a plan for regular data recording such as water bills, number of hotel guests, monitoring of damage or leakage of water-usage equipment as information to reduce water consumption and monitor employees' operation in concordance with the hotel water conservation policy and give credit to employees who work to reach the common goal as part of the hotel policy.

5) Staff: By assigning position in accordance with knowledge and ability of employees to forge unity of teamwork such as all employees taking interest in finding damage or leakage of water-usage equipment and not leaving it to the responsibility of maintenance employees.

6) Skill: By providing internal training for new employees to be acquainted with hotel policy and water conservation measures in order to work in accordance with the policy and measures. Annual training should be provided to old employees in order to be regularly reminded of water conservation. Employees should also be sent for external training to enhance their knowledge, ability and development of employees according to their individual expertise such as maintenance employees assigned to participate in external training or visit projects relating to technology, equipment, or other methods in water conservation.

7) Shared value: Raise the awareness and conscience of employees in water conservation, with common commitment to reduce water consumption. Hotel owners must participate as well to set good example to the employees.

4.6.2 Water footprint assessment of hotels type 1

The water footprint assessment of hotels type 1 could be conducted through the HWMI Methodology 2016 which states that “The methodology is designed to be applied by any hotel anywhere in the world. The methodology has been designed in partnership with major hotel groups; it applies to individual hotels, large and small, regardless of the type of amenities offered”. Therefore, water footprint assessment of hotels type 1, water footprint assessment was modified to comply with the classification of hotels type 1 as follows:

Methodology for hotels type 1 in Bangkok.

Step 1 Information

- Total number of guest rooms per year
- Number of occupied guest rooms annual
- Total hotel floor area square meter (m²)

Step 2 Hotel water used

Water source	Data source	Calculation
Metered municipal water (mains)	Invoice / meter reading	Sum of the report year
Outsourced laundry (only one option from option A or B or C)	Option A: Total water from supplier Option B: Total tonnage from supplier Option C: Estimation	Sum of the report year Total tonnage * 20,000 L Estimated tonnage: 0.00512 tones per occupied room

Step 3 Private space

If a hotel has private space and water use associated with this area is included in the hotel bills / metering, it needs to deduct from the hotel.

- Subtracting sub-metered water used by private space (if all water used in the private areas are sub-metered); or

- Subtracting a percentage of total used based on area apportionment of private space to the total hotel floor area.

Step 4 Determining water use per guest (per night) and per occupied room (per night)

$$\text{Total per guest (per night)} = \frac{\text{Total water of guest rooms use}}{\text{Total number of guests (per year)}}$$

$$\text{Total per occupied room (per night)} = \frac{\text{Total water of guest rooms use}}{\text{Number of occupied rooms (annual)}}$$

CHAPTER 5

CONCLUSION, DISCUSSIONS, AND RECOMMENDATIONS

This study aimed to: (1) assess the water footprint of hotels type 1 in Bangkok; (2) study water management of hotels type 1 in Bangkok; and (3) recommend a guideline for the water management of hotels type 1 in Bangkok. The study consisted of the following:

Part 1: Policies, measures, regulations, and water footprint of hotels – Study by review of relevant policies and implementing persons who were representatives from the public and private sectors, that is, those charged with formulation of policies and measures relevant to the hotel business and environment.

Part 2: Lessons learned, success, environmental management of hotels with environmental-friendly awards (Green Hotel) – Study by interview. The informants were representatives of Green Hotel award-winning hotels consisting of general managers, quality managers, engineering managers, and human resource managers. The researcher used the information obtained from the interviews to accompany the analysis of the guideline of sustainable water management for hotels type 1.

Part 3: The findings of water footprint assessment and opinions of external and internal factors on water management of hotels type 1 in Bangkok – Study by collecting data via questionnaires. The informants were representatives of hotels type 1 in Bangkok consisting of managers, management trainees, welcoming staff, general staff, regular staff, cleaning staff, and maintenance staff.

5.1 Conclusion and Discussions of the Findings

5.1.1 Policies, measures, regulations, and water footprint of hotels

The agencies charged with policy formulation promoted business entities both in the manufacturing and service sectors to realize the importance of the environment and environmental conservation which has become a major issue around the world. However, in Thailand, recognition and awareness of environmental-friendly labels and awards has attracted little interest especially with small- and medium-sized hotels. On the whole, large hotels and foreign-affiliated hotels have focused on the issue. Moreover, water footprint is not widely known despite its importance to water management. This is in concordance with Teeranong Sakulsri who said, we have abundant water and we are used to cheap water bills all along. We may consider water as not important. (BLT Bangkok, 2019)

Public relations or knowledge provided to hotel business operators would enhance understanding and change water usage behavior. The most important factor contributing to the application of water footprint to hotel business was the commitment and support of executives. Knowledge and understanding of water footprint of the implementing persons, correct information recording, awareness and importance of water source, as well as promotion measures for motivation were also significant. The obstructing factors were employees' unpreparedness both in terms of knowledge, insufficient number of employees, and language for communication requiring simple language for acknowledgement and understanding. In regards to the guideline to drive and inspire, and the measures to apply water footprint to the hotel business, the relevant agencies should formulate action plans and take measures to apply water footprint to hotels, as well as provide knowledge to the hotels so that they learn of the benefit they would receive from water footprint assessment. They can also publicize successful hotels as examples and inspiration for other hotels to join the project and devise other incentives such as tax deduction and increase government funding to operate the project.

5.1.2 Lessons learned, importance, and water management of hotels with environmental-friendly awards (Green Hotel)

The findings of all Green Hotel award-winning hotels (Hotels A-G) through interviews could be summarized as follows: (1) all Green Hotel formulated policy on water conservation as part of their overall policy (2) structure of duties and responsibility was clearly defined (3) all hotels stated that owners and executive were essential to successful implementation, including policy formulation and participation in policy implementation (4) knowledge of water conservation through training for new employees and annual training on the environment with the topic of water conservation for old employees to raise the awareness of water conservation; (5) all hotels used technology, water-saving equipment, and had guidelines and methods for water conservation such as unfinished drinking water in guest rooms be accumulated to water trees, installation of automatic equipment to control the time for watering trees; and (6) most award-winning Green Hotels were interested in water footprint assessment in compliance with the trend toward environmental concern and environmental-friendly hotels.

As this was the issue that most people placed importance on and took interest in, it would enhance the image of hotels and increase the number of users. The hotels with environmental-friendly awards (Green Hotel) were large hotels or foreign-affiliated. As one interviewee stated, “The hotels focusing on environment are mostly large hotels or foreign-affiliated hotels. This is probably because the hotels are experienced in entertaining foreign guests who place importance on environment or because it is the wish of hotel owners to standardize their hotel groups worldwide.” The efficient water management within the hotels with environmental-friendly awards must pass the assessment criteria according to the standards of Green Hotel project as stipulated by the Department of Environmental Quality Promotion. Therefore, the guideline of the implementation of the hotels with environmental-friendly awards was appropriately applied and the water management of hotels type 1 in Bangkok was recommended.

5.1.3 Water footprint assessment of hotels type 1 in Bangkok

The findings of nineteen hotels type 1 in Bangkok were conducted according to the HWMI Methodology. The benchmark for freshwater use in guest room was based on good = less than 300, fair = 300-350, poor = greater than 350 liters per guest night (The International Business Leaders Forum's Tourism Partnership, n.d.). The findings revealed that of the 19 hotels (volume of the water use for 1 person/night): 5 hotels (38.46%) were good, 1 hotel (5.26%) was fair, and 13 hotels (68.42%) were poor. Factors affecting the water footprint included the number of hotel guests, number of days of stay, number of rooms, facility, nationality, and behavior of water consumption. This is similar to the research of Seeduka (2013) who studied the hotel water consumption behavior in Phuket province. As one interviewed policy maker said, "The factor that contributes to the behavior of excessive water consumption in Thailand is because our water bills are not high." This is in concordance with Teeranong Sakulsri who said, "Up till now, we are used to the fact that in Thailand we have abundant water and we are used to cheap water bills all along. We may consider water as not important. But in other countries, water bills are much higher than ours, so they realize the value of water. It is hoped that the government sector will formulate the conservation guideline and systematic operation, including consideration of appropriate price mechanism to make the Thai realize the importance of water". (BLT Bangkok, 2019) While the actual water consumption is based on main water meter reading, some hotels had shared area for rent but no sub-water meter, which is why the amount of tap water used is high and resulted in a large water footprint.

1) Strategy

The operation was mostly controlled by hotel owners. Hotel owners made independent decisions. Therefore, they must have the intention and commitment to formulate water conservation policy and measure as part of the overall policy and measure platform.

2) Structure

Clear formulation of structure of duties and responsibilities enables employees to perform their work in accordance with their position and duties to the utmost ability. This will reduce the pressure on employees for having to do work they were not skilled in. For example, one informant said, "I have to do all the work, as manager, maintenance employee, and checking in the hotel guests."

3) System

Modification to water-saving equipment. If hotels have limited budget, they could adjust the to a slower flow rate, lower the volume of water in the toilet to reduce the volume of water used per one flush, and signs or labels posted to campaign for water-saving within rooms, offices, and common areas.

4) Style

Promotion of the use of water-saving equipment. Regular information recording was put in place such as water bills, number of guests, and monitoring of damage or leakage of equipment to reduce the loss of water and serve as the information to determine the implementing guideline to reduce use; monitoring and investigating of employees' operation in concordance with hotel water conservation policy; and organizing activities and monitoring of operation. If employees reach the target, they should be rewarded so that they would be encouraged to continue.

5) Staff

Set teamwork and assignment of position in accordance with the employees' knowledge and ability. Encouragement of unity and teamwork such as every employee being attentive for any damage or leakage of equipment, and not leaving it to the maintenance employees alone.

6) Skill

Internal training for new employees to familiarize them with the water conservation policy and measures so that they perform work in accordance with the policy and measures. Annual training for old employees to make them aware of water conservation. Dispatch of employees to join external training to enhance knowledge,

ability, and personnel development according to individual expertise such as assigning maintenance staff to join external training, visits, and projects related to water conservation technology, equipment, or other methods.

7) Shared values

Raise awareness and conscience of employees for economical use of water by hotel owners by talking to staff about water saving. Hotel owners must participate in the implementation to serves as good examples to their employees.

For self-study, employee can learn from water management of hotels type 1 in Bangkok and guidelines the research mentioned in infographic in Figure 5.1 and 5.2. The guideline of water management of hotels type 1 in Bangkok was an analysis of the data obtained from interviews with policy makers and informants form hotels with environmental-friendly awards. The researcher compiled information for analysis and recommended a guideline for water management of hotels type 1 in Bangkok based on McKinsey 7S Model and in accordance with the study of Songkramsri (2017) who stated that the internal factors impact management because internal factors are under the control of an organization and thus the organization can devise strategies that can blend with different environment. This was in concordance with Sittichai and Pooripakdee (2018) who investigated the methods of organizational management according to the concept of McKinsey 7S Model to study the operation or activity of each factor with findings used as a guideline to develop the organization toward being innovative.

Study limitations

1) As hotels type 1 have few staff, thus most of key informants providing details of water consumption in the guest room was welcoming staff or reception. It was difficult for them to provide a bill for tap water use, so the researcher asked for tap water bill from Metropolitan Waterworks Authority (MWA).

2) A number of guests per year is approximated by the reception and thus there might be some value might be inaccurate.

5.2 Recommendations

5.2.1 Policy recommendations

1) MWA or Thailand or Ministry of Natural Resources and Environment (MNRE) should be established with direct responsibilities for water footprint. MWA is the main agency for tap water and has a mission deliver professional water supply services to reach and balance stakeholder needs, and improve people's quality of life by expending water service and societal responsibility throughout Thailand or Ministry of Natural Resources and Environment because one of its missions is to develop mechanisms and databases for management including improving and enforcing the law fairly. It can provide information, advice, serve as an information center for water footprint, support waster footprint assessment, reduce water footprint, and provide advice to public and private agencies on water footprint assessment.

2) MWA or MNRE should be accelerate the clear formulation of water footprint policies and measures for entrepreneurs to implement, in accordance with the policies and measures as stipulated by the government.

3) MWA or MNRE should be accelerate dissemination and public relations to all sectors, including agriculture, industry, and service business so that all sectors would be educated on water footprint, be aware of the water footprint from their own activities, and strive to find the means to reduce their water footprint.

4) Department of Environmental Quality Promotion (DEQP) which has already been implemented of hotels with environmental-friendly awards (Green Hotel). Therefore, conduct workshop projects on water footprint to be organized to transfer knowledge to hotel business operators and train them on correct methods of water footprint assessment. Furthermore, a pilot project should be established for interested hotels to join water footprint assessment to act as examples for other hotels who will see the concrete benefits of participation such as real reduction of water bills, and improved image of environmental-friendly hotels leading to increase in the number of guests.

5) Ministry of Tourism & Sports (MOST) or DEQP or should be provide funding to hotel business operators for water footprint assessment and engage successful pilot hotels to act as coaches to assist other hotels interested in joining the project.

6) Department of Provincial Administration (DOPA) or MOST or DEQP should be motivate participation in the water footprint assessment project by reducing fees for the extension of hotel business operation permits, as well as presenting plaques, certificates and other public relations activities of the hotels participating in the project. Moreover, government agencies, the private sector, and tour operators might be encouraged to choose the services of the hotels participating in the project.

7) Private sector is involved with the government or is the main agency for the project of water footprint such as Association of Thailand Agents (ATTA) or Thai Hotels Association.

According to the findings, many hotels were already interested in water footprint assessment. If the hotels formulated additional policies on water footprint assessment, this would support the existing water conservation policy. Moreover, the application of the McKinsey 7S Model in management would enhance efficient water management.

5.2.2 Implementation recommendations

1) The findings revealed that hotels type 1 were providing services for accommodations only. Therefore, they were small hotels and operated and controlled by hotel owners or sole proprietorship. Their strengths were freedom, flexibility, and independent decision-making (Parakan, n.d.). Therefore, the most important factor leading to water footprint assessment of hotels type 1 is to start with hotel owners. Owners of these hotels should be invited to join seminars, training, and other activities to exchange views, knowledge, and learn about the benefits that they would receive from the project. This in accord with the research of Petchouy and Sittipongpittaya (2017) that leadership affected work behavior and motivation to reach organization's goals.

2) The findings revealed that most hotels type 1 did not provide training to employees on water conservation. Therefore, hotels should organize training or send employees to join external training to learn the importance and acquire the knowledge on the methods of water conservation in order to reach the goal of water use reduction. This finding is in accord with the research of Mbasera, Du Plessis, Saayman, and Kruger (2016) who stated that training is an important activity in management of environmental-friendly hotels. The training of employees will enable them to have clearer understanding of environmental management and enable them to participate fully in their work (Mbasera et al., 2016).

3) Based on the findings, none of the hotels type 1 in Bangkok investigated gave rewards to their employees. There should be rewards to inspire employees to continue their good work with more enthusiasm, leading to the organization's success. This finding is in accordance with the study of Tippratum, Kongklay, and Kittisaknawi (2017) who found that rewards and employees constitute a human resource management that the organization must pay attention to. An organization must motivate its employees with rewards to foster work satisfaction. This represents value of the employees in their efforts to efficiently materialize their work and affect the success of the organization in reaching its goals (Tippratum et al., 2017).

5.2.3 Recommendations for future research

1) Investigate the water footprint assessment of hotels types 2, 3, and 4 as this study focused on hotels type 1 (type of hotel according to the ministerial notification to determine types and criteria of hotel business operation B.E. 2551 (2008))

2) Based on the review of research, most studies on water footprint has focused on agriculture. Therefore, future research should cover service providers, which is a sector that consumes a large amount of water, including department stores, hospitals, golf courses, and theme parks.

3) From the data obtained interviews with policy makers and informants from hotels with environmental-friendly awards, and water management of hotels type 1 in

Bangkok and guidelines the research mentioned in infographic for hotel type 1 in Figure 5.1 and 5.2





Figure 5.1 The water footprint assessment of hotel type1 in Bangkok

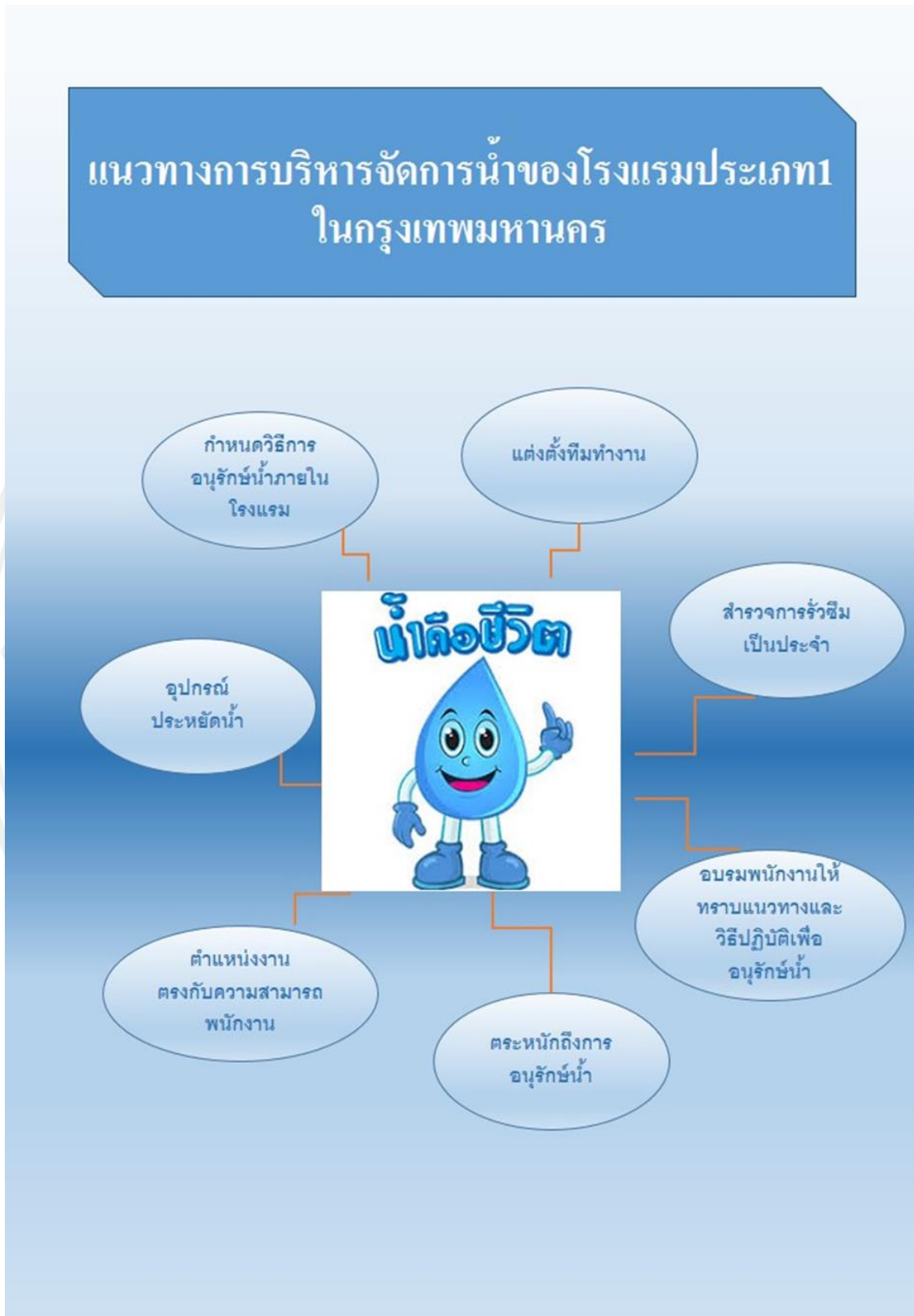


Figure 5.2 Guideline of water management of hotels type 1 in Bangkok



APPENDICES



APPENDIX A

Interview Form for Policy Makers

Interview Form for Policy Makers
The Water Footprint Assessment of Hotels Type 1 in Bangkok

Part 1 General information of the informant

Name.....

Organization.....

Position.....

Part 2 Questions for the interview

1. How do policy, strategy, and action plan support environment of your hotel business?

.....
.....
.....

2. What is the current trend of environmental preservation in hotel business?

.....
.....
.....

3. How do you think your hotel is aware and conscious of environmental-friendly labels or awards such as Green Hotel, carbon footprint, and water footprint?

.....
.....
.....

4. Do you think your hotel render much or little cooperation to the operation of environmental-friendly hotel? What do you think should be done to attract hotels to participate in the project especially hotels type 1?

.....
.....
.....

5. Are you acquainted with water footprint? In your opinion, is water footprint very important or not to hotel business? What are activities or projects related to water preservation?

.....
.....
.....

6. What should be the guideline of sustainable water management for hotel business?

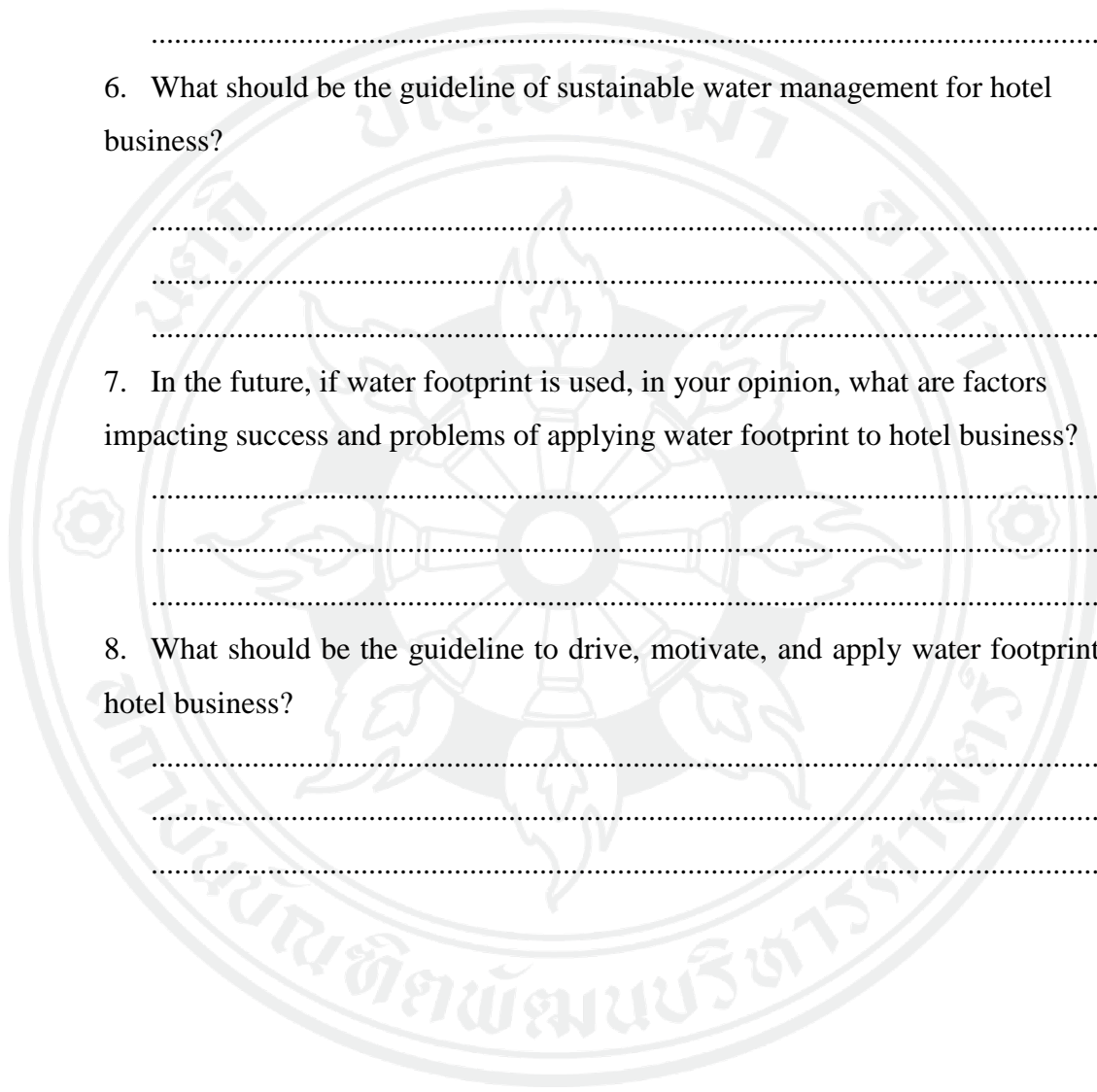
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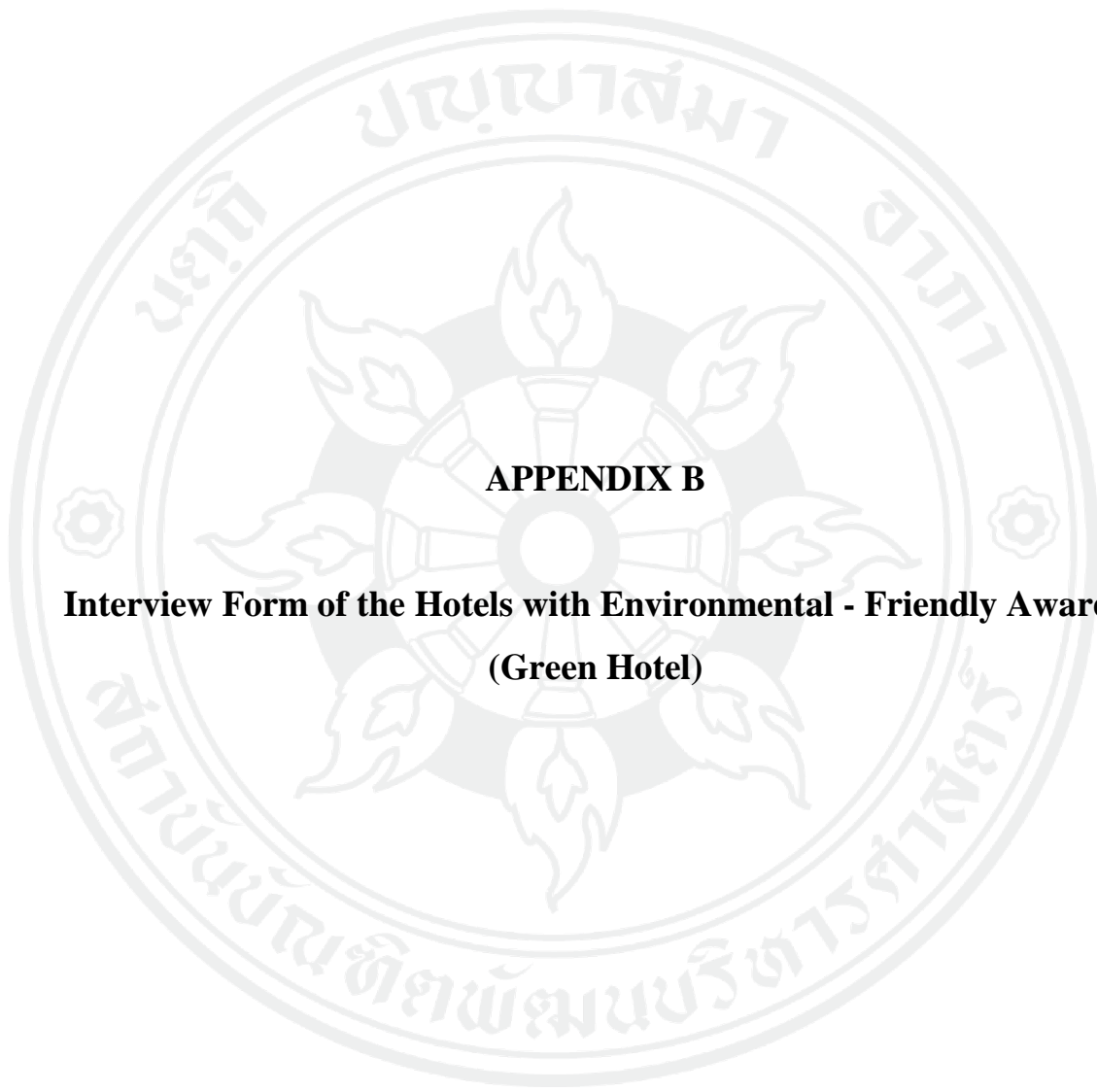
7. In the future, if water footprint is used, in your opinion, what are factors impacting success and problems of applying water footprint to hotel business?

.....
.....
.....

8. What should be the guideline to drive, motivate, and apply water footprint to hotel business?

.....
.....
.....





APPENDIX B

**Interview Form of the Hotels with Environmental - Friendly Awards
(Green Hotel)**

Interview Form of the Hotels with Environmental - Friendly Awards (Green Hotel)
The Water Footprint Assessment of Hotels Type 1 in Bangkok

Part 1 General information of the informant

Name.....

Organization.....

Position.....

Part 2 Questions for the interview

1. What is the current trend of environmental preservation in hotel business?

.....
.....
.....

2. How do you think your hotel is aware and conscious of environmental-friendly labels or awards such as carbon footprint, water footprint, Green Hotel, Green Leaf?

.....
.....
.....

3. Do external agencies, both public and private, render support to the operation of environmental-friendly hotels?

.....
.....
.....

4. What is your opinion on the image of an environmental-friendly hotel?

.....
.....
.....

5. What is the policy, strategy, and action plan to support your hotel's environmental policy?

.....
.....
.....

6. What are the factors that allow your hotel to win the environmental-friendly award?

.....
.....
.....

7. What are water preservation activities in your hotel?

.....
.....
.....

8. What are your recommendations to promote hotels type 1 to conduct water preservation within their hotels or participate in the environmental-friendly hotel project?

.....
.....
.....

9. What should be the guideline of sustainable water management for hotel business?

.....
.....
.....

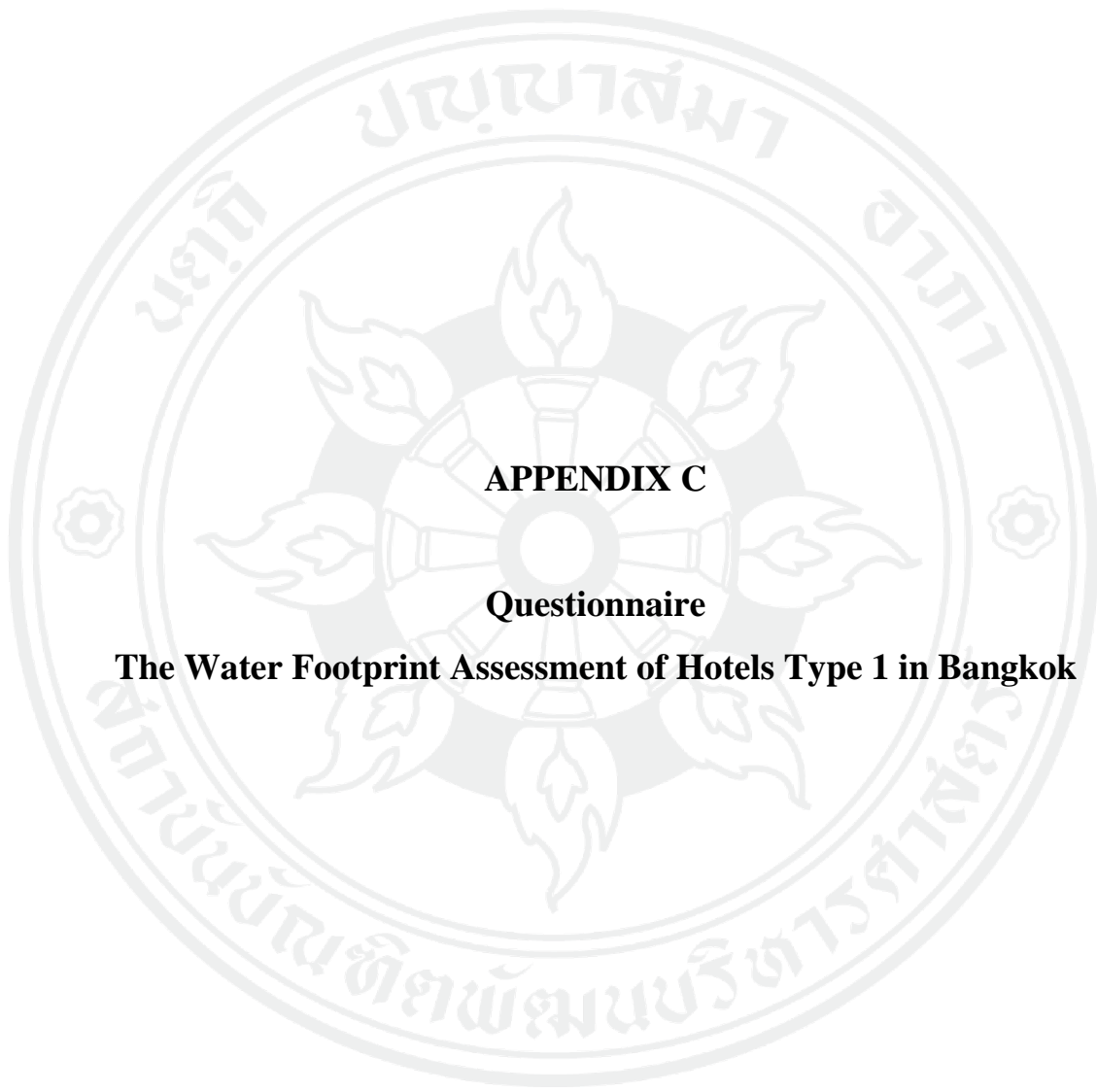
10. Are you acquainted with water footprint? Do you think water footprint is very important or not in hotel business?

.....
.....
.....

11. In the future, if water footprint is used, in your opinion, what are factors impacting success and problems of applying water footprint to hotel business?

.....
.....
.....





APPENDIX C

Questionnaire

The Water Footprint Assessment of Hotels Type 1 in Bangkok

Questionnaire

No.....

Questionnaire**The Water Footprint Assessment of Hotels Type 1 in Bangkok****Explanation**

The questionnaire consists of the questions in 4 parts.

Part 1 General information of the informant

Part 2 Information for water footprint assessment

Part 3 Opinion on external factors impacting water management of hotels type 1 in Bangkok

Part 4 Opinion on internal factors impacting water management of hotels type 1 in Bangkok

Part 1 General information of the informant

Explanation Please fill in the information.

1. Name of establishment

(Thai).....

No..... Moo..... Road..... Soi.....

Subdistrict..... District..... Bangkok

2. Position of the questionnaire's respondent Work

experience..... Years

Tel. E-mail.....

Part 2 Information for water footprint assessment

2.1 Information on the amount of the use of tap water (yearly)

Please fill in the information of the past 5 years or as available

Information	2013	2014	2015	2016	2017
Amount of the use of tap water (unit/yearly)					
Expenses on water (baht/year)					

2.2 Areas in the hotel and types of rooms

Total area of the hotel.....square meters

Types of rooms in hotel	No of rooms	Area (square meters/room)	% of the hotel's total area
Hotel rooms			
Kitchens			
Washing rooms			
Restrooms outside hotel rooms			
Relaxation rooms for employees			
Other rooms such as			
Other rooms such as			

2.3 Information of hotel guests

2.3.1 Total number of hotel guests.....persons/year

2.3.2 Average number of hotel guests..... persons/room

2.4 Laundry

2.4.1 Does your hotel outsource external laundry service?

Yes No

2.4.1.1 If you say “**yes**” in item 2.4.1, how often do you send your laundry to external laundry service, every () day () week () others.....

2.4.1.2 If you say ”**yes**” in item 2.4.1, do you know the amount of water that your external laundry service uses for one time to clean your laundry?

Yes Please specify the amount of water

() units () liters () cubic meters / one time (1,000 liters = 1 cubic meter)

No Please answer item 2.4.2

2.4.2 If you answer “No” in item 2.4.1.2, do you know the weight of the laundry that you send to external laundry service for one time?

Yes Please specify the weight of the laundry.....

() kilograms () tons / one time (1,000 kgs = 1 ton)

No

2.5 Rented space

2.5.1 Is there rented space in your hotel?

Yes No

2.5.2 If you say “Yes”, is the rented space in your hotel installed with separate water meter?

Yes Please specify the amount of water used from the rented space
() units () liters () cubic meters/month

No Please specify the area used as rented spacesquare meters
And the rented space constitutes %of the total area

Part 3 Opinion on external factors impacting water and wastewater management of hotels type 1 in Bangkok

3.1 Are you acquainted with water footprint?

() Yes () No

Water footprint means the volume of consumption of water of one hotel guest/one night in hotel type 1 with the unit of cubic meter/person/night.

3.2 Please mark ✓ in the space according to your opinion

Items	Questions	Agree	Disagree	Uncertain
1	The government’s policy and measures of tourism promotion increase the number of guests in your hotel			
2	The government’s policy and measures of water preservation promotion such as water saving, reduced water loss from inspection of internal pipe damage or leakage can help your hotel save water bills			
3	Tourism-related economic situations and growth of tourism business increase the number of guests in your hotel			
4	Increased number of tourists impact increased use of water			
5	Use of water-saving equipment and tools in the hotel can reduce the use of water and water bills			

Items	Questions	Agree	Disagree	Uncertain
6	Water resource is crucial to hotel business			
7	The shortage of tap water in Bangkok will damage hotel business			
8	Quality of tap water in Bangkok impacts hotel business operation			
9	Safety from epidemics, water-borne diseases from consumption of tap water in Bangkok impacts hotel business operation			
10	The problems of water pollution in Bangkok will damage hotel business			
11	If the government enforces every hotel to conduct water footprint assessment			
12	If the government introduces promotion measures to award hotels that can reduce water consumption such as plaques, certificates, or tax deduction			
13	If your hotel participates in the water footprint project and wins the award, it will enhance your hotel's good image			

Part 4 Opinion on internal factors impacting water and wastewater management of hotels type1 in Bangkok

Please mark ✓ in the space and fill in the information in accordance with your hotel's internal information

1. Does your hotel have water preservation policy?

Yes (Please specify)

.....

No

2. Does your hotel formulate water preservation strategy for employees to comply with?

Yes (Please specify)

.....

No

3. Does your hotel organize internal activities for water preservation?

Yes (Please specify)

.....

No

4. Does your hotel assign duties to employees in accordance with their position, knowledge, and ability?

Yes No

5. Does your hotel organize training on water preservation for employees or send them for training with external agencies?

Yes No

6. Does your hotel award departments or employees with awareness of water preservation?

Yes No

7. Does your hotel monitor, inspect, and assess operation of each department of employee in implementing policy, action plan, or activities on water preservation?

Yes (Please specify)

.....

No

8. Employees in your hotel realize the importance of water resource

Yes No

9. Employees in your hotel cooperate in the hotel's internal water preservation

Yes No

10. Your hotel uses water-saving equipment and toilets

Yes (Please specify)

.....

No

11. Your hotel surveys damaged and leaked pipes in the hotel or damage and leakage of water-using equipment

Yes () daily () weekly () monthly () other
 who makes survey?.....

No

12. Does your hotel post labels, posters, or signs in guest rooms or in the hotel's vicinity to encourage hotel guests and employees to participate in water preservation?

Yes

..... Sign for guests to ask hotel housekeeper "not to change towels"

..... Sign for guests to ask hotel housekeeper "not to change bed sheets"

..... Sign to warn "to turn off water when not in use"

..... Others.....

No

13. Does your hotel reuse treated water for other activities?

Yes (Please specify activity)

.....

No

14. Does your hotel have wastewater treatment before discharge into public water sources?

Yes (Please specify method of wastewater treatment)

.....

No

15. Up till now, the operation of your hotel business has not faced the problems of the shortage of tap water

Yes No

16. Up till now, the operation of your hotel business has not faced with the problems of water pollution

Yes No

17. You think that the water footprint assessment will save water and reduce water bills for hotel business

Agree Disagree Uncertain

18. If the public or private sector provides knowledge and invites your hotel to join the water footprint assessment project, will you be interested in joining?

Yes No

19. If you answer “yes” in item 18, what are the major factors that interest you to join water footprint assessment?

(Please fill in items 1 – 6 according to its ranking importance in your opinion)

..... The hotel’s good image

.....Increased number of hotel guests

.....Reduced water consumption and water bills

.....Contribute to preserve water resource

.....Reward from the government sector such as tax deduction

.....Others (Please specify)

*****Thank you very much for kindly answering the questionnaire*****



APPENDIX D

**Recommendation Form of the Assessor for the Consideration of
Conceptual Framework and Indicators**

Recommendation Form of the Assessor for the Consideration of Conceptual Framework and Indicators

Research on The Water Footprint Assessment of Hotels Type 1 in Bangkok

Basic information of the assessor

Name

.....

Position

.....

Office

.....

Recommendations of the assessor

1.1 Appropriateness of the conceptual framework of water footprint assessment of hotels type 1 in Bangkok (according to the research project page 3)

Appropriate Inappropriate

Recommendations for modification

.....

.....

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.....

1.2 Guideline to develop the conceptual framework of water footprint assessment of hotels type 1 in Bangkok

.....

.....

.....

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.....

.....



2. Appropriateness of the indicators for the water footprint assessment of hotels type 1 in Bangkok **(to construct interviews and questionnaires)**

External factors

Indicators	Definition	Appropriate	Inappropriate	Recommendations
Water preservation policy	Implementing guideline to guide activities or implementation of water preservation in order to reach the set objectives			
Tourism policy	Implementing guideline to guide activities or implementation of promotion of tourism industry in order to reach the set objectives			
Tourism-related economy	Situations of income from tourism business and number of tourists generating employment, income, stimulating investment, and development of services and facilities to support tourism			
Growth of tourism business	Activities of tourism-based services such as travelling, food and accommodations, guides generating income for local and domestic entrepreneurs from tourism business and investment in tourist destinations, accommodations, and services for comfort and			

Indicators	Definition	Appropriate	Inappropriate	Recommendations
	convenience of tourists and to cater to increased number of tourists			
Growth of tourists	Increased number and diversity of tourists from all over the world			
Society	Awareness of social trend of environmental-friendly hotels			
Technology	New inventions or development/improvement of old inventions for water-saving benefit			
Situations of water resources	Current amount of water is sufficient for consumption, industrial and agricultural sectors, situations of wastewater, including social and global trends of water preservation			
Water footprint	Amount of the use of water of one hotel guest/night in hotels type 1 Unit in cubic meters			
Law	Rules and regulations on water footprint formulated by the authority for hotel business operators' compliance			

Internal factors

Indicators	Definitions	Appropriate	inappropriate	Recommendations
Organizational policy	Principles considered as guideline for all employees and all units in organization to work while taking into account water preservation policy			
Strategy	Formulate action plan on water preservation in hotel for employees' operation to reach the common target of water preservation			
Reward	Rewards in cash or in kind such as plaque or certificate to inspire the employees whose work reach the target based on organization's policy			
Organizational policy	Principles considered as guideline for all employees and all units in organization to work while taking into account water preservation policy			
Strategy	Formulate action plan on water preservation in hotel for employees' operation to reach the common target of water preservation			
Reward	Rewards in cash or in kind such as plaque or certificate to inspire the employees whose work reach the target based on organization's policy			

Indicators	Definitions	Appropriate	inappropriate	Recommendations
Duty	Assign work to each employee in accordance with knowledge and ability			
Knowledge	Content and information on water preservation transferred to all employees, including internal and external trainings for implementation			
Cooperation	Willingness to work and assist on the part of all employees and hotel guests to reach the common target of water preservation			
Technology	New inventions or development/improvement of old inventions for water-saving benefit			
Equipment	Water-saving equipment and tools such as toilet, water faucet, shower, bidet shower			
Activities	Implementation and promotion of water preservation through cooperation of employees			
Organizational management	Assignment of duties to employees, training provided for them, enhancement of cooperation for them to work to reach the set target			
Communication	Dissemination in the form of discussions, putting up labels, signs, or posters on water preservation to			

Indicators	Definitions	Appropriate	inappropriate	Recommendations
	motivate employees and hotel guests to be aware of water preservation			
Monitoring and inspection	Inspection of operation and performance to see whether they reach the target such as reduction of the monthly use of water to reach the set target or inspection of water-using equipment to see whether they function normally without leakage			
Maintenance	Maintain water-using equipment in good condition for normal function without damage, or if damage is found, there must be repair for normal function			
Awareness	Recognition of the importance of water resource, water shortage, and problems of water pollution			
Conscience	Employees are always aware of doing their work for water preservation			

Thank you for taking your time to answer the questionnaire

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