

**Evaluation of the Local Capacity in Solid Waste Management
at Source, Phuket Case Study**

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Master of Science in Technology and Environmental Management**

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Thesis Title Evaluation of the local capacity in solid waste management at source,
Phuket case study

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Abstract

This research aims to study the solid waste management (SWM) system using Phuket as a case study. It analyzes the weaknesses of the current SWM by focusing on the sources which are the 19 local administrative organizations (LAOs) and make recommendations to improve the SWM that is appropriate to Phuket context. The study uses qualitative methods through the collection and analysis of SWM policy documents, reports, news, interviews with officers from 19 LAO and observations during the meetings and activities relevant to Phuket SWM at both provincial and local levels. The findings reveal that although Phuket SWM is “centralized” using landfills and the incinerator, the SWM strategies used by 19 LAOs and the contracted companies have very different approaches and standards. There are three different approaches of SWM adopted by the LAOs: 1) self-management of the operation by the LAO; 2) partial outsourced to a private company for collection; and 3) total outsourced to a private company for collection and staff. This difference depends on the area contexts and decisions of the LAO leaders. The weaknesses of Phuket SWM are found in the lack of law enforcement and regulations especially by the LAOs. The lack of awareness in the SW problems and the level of responsibility by the public officials and people in the communities can also be attributable to the lack of ownership and leadership in the community. Therefore, the development of environmental leadership is key to improve public awareness and participation in SWM. Changes in the attitude and perception of the SW problems in the stakeholders will help mitigate problems and improve the effectiveness of SWM by reducing waste at source.

Keywords: Solid Waste Management, Local Administrative Organizations, Civil Society, Environmental Governance, Phuket, Thailand

ชื่อวิทยานิพนธ์ การประเมินศักยภาพการกำจัดขยะที่แหล่งกำเนิดของท้องถิ่น
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บทคัดย่อ

งานวิจัยฉบับนี้มีวัตถุประสงค์ เพื่อศึกษารูปแบบของการจัดการขยะ โดยใช้จังหวัดภูเก็ตเป็นกรณีศึกษา เป็นการวิเคราะห์จุดอ่อนของการจัดการขยะในปัจจุบัน โดยเน้นที่แหล่งกำเนิดจากองค์การปกครองส่วนท้องถิ่น 19 แห่ง และเสนอแนวทางแก้ไขให้รูปแบบการจัดการมีความเหมาะสมกับบริบทของจังหวัดภูเก็ต วิธีการวิจัยใช้วิธีการเชิงคุณภาพ ผ่านการรวบรวมและวิเคราะห์ข้อมูลการจัดการขยะมูลฝอยจังหวัดภูเก็ต รายงานท้องถิ่นและสื่อสิ่งพิมพ์ การสัมภาษณ์เชิงลึกจาก 19 องค์การปกครองส่วนท้องถิ่นและการเข้าไปมีส่วนร่วมในการประชุมและกิจกรรมที่เกี่ยวข้องกับการจัดการขยะของจังหวัดภูเก็ตทั้งในระดับจังหวัดและชุมชน ผลการศึกษพบว่า ถึงแม้ว่าจังหวัดภูเก็ตจะใช้การกำจัดขยะแบบรวมศูนย์ โดยการฝังกลบและการเผา แต่การจัดการขยะโดย 19 องค์การปกครองส่วนท้องถิ่นและผู้รับเหมาเก็บขยะจากท้องถิ่นจะมีรูปแบบและมาตรฐานที่แตกต่างกัน โดยกลยุทธ์การเก็บขนขยะมูลฝอยขององค์การปกครองส่วนท้องถิ่นแบ่งออกเป็น 3 รูปแบบ คือ 1) การบริหารจัดการโดยองค์การปกครองส่วนท้องถิ่นทั้งหมด 2) การจ้างเอกชนโดยแบ่งพื้นที่ให้เอกชนเข้ามาช่วยเก็บขยะมูลฝอย 3) การจ้างเอกชนเข้ามาจัดการทั้งหมดในเรื่องรถและคนเก็บขยะ ซึ่งความแตกต่างนั้นขึ้นอยู่กับบริบทพื้นที่และการตัดสินใจของผู้บริหาร นอกจากนี้ ยังพบจุดอ่อนของระบบบริหารจัดการขยะมูลฝอย ในจังหวัดภูเก็ต ในเรื่องการขาดการบังคับใช้กฎหมาย ระเบียบและมาตรฐานของการปฏิบัติงานอย่างเป็นรูปธรรม โดยเฉพาะในระดับท้องถิ่นการขาดความตระหนักในบทบาทและความรับผิดชอบของเจ้าหน้าที่รัฐในท้องถิ่นและประชาชนในชุมชน อาจเป็นผลมาจากการขาดของความเป็นเจ้าของในปัญหาของท้องถิ่นและการขาดการพัฒนาด้านความเป็นผู้นำในชุมชน ดังนั้น การสร้างความเป็นผู้นำด้านสิ่งแวดล้อมจึงเป็นกุญแจสำคัญในการพัฒนาความตระหนักด้านสิ่งแวดล้อม และเพิ่มการมีส่วนร่วมของประชาชนในการจัดการขยะมูลฝอยการเปลี่ยนแปลงทัศนคติและการรับรู้เกี่ยวกับปัญหาขยะมูลฝอยในกลุ่มผู้มีส่วนได้ส่วนเสียจะสามารถช่วยบรรเทาปัญหา และเพิ่มประสิทธิภาพการจัดการขยะมูลฝอยที่แหล่งกำเนิดได้

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Solid waste (SW) is one of the major environmental problems in Thailand. The volume of solid waste has grown rapidly in many areas especially in urban centers (Pollution Control Department, 2012). Phuket province which is one of the major tourist destinations in the country has serious SW issues which include overflowing waste into the natural landscape, unpleasant smell, water pollution, and pathogens that affect public health and the environment in the community (Sawangchai, 2012). Furthermore, the amount of waste in Phuket continues to increase every year.

Phuket province has grown continuously in all areas. These areas have different rate of growth which is demonstrated by the population increase. (Figure 1.1)

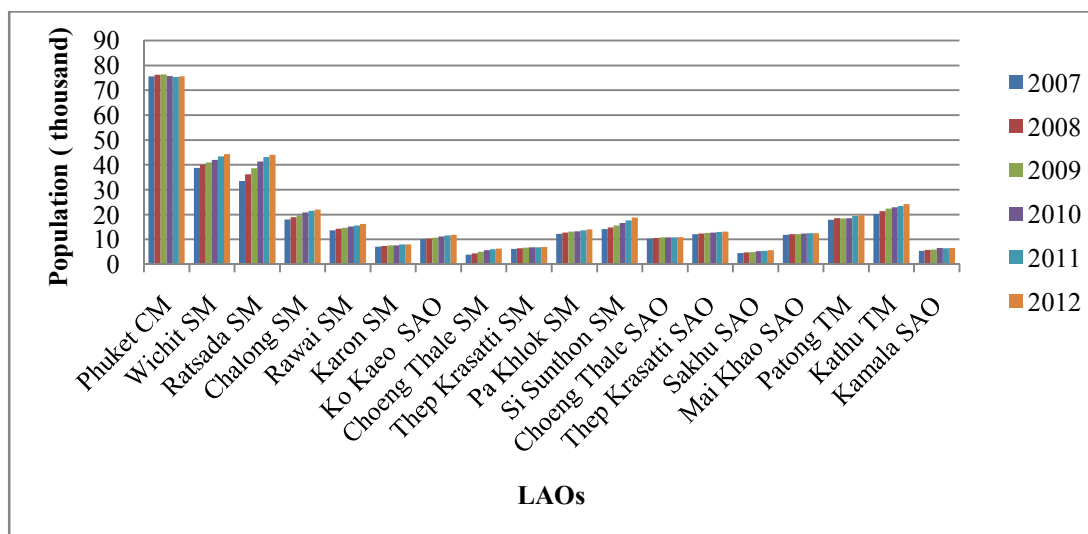


Figure 1.1 Phuket population categorized by Local Administrative Organizations (LAOs) from 2007-2012¹ (Official Statistics Registration Systems, 2013)

The LAO with the highest population density is Phuket City Municipality (CM) which has the population density of 6,295 people per square kilometer. This is followed by Wichit Sub-district Municipality (SM) and Ratsada SM where the population densities are 971 and 1,157 people per square kilometer respectively (Official Statistics Registration Systems, 2013). These numbers exclude tourists and non-registered residents or “hidden population” who have their names registered in houses elsewhere but live and work in Phuket. The rapidly growing population and increasing urbanization result in environmental issues in many areas including the increase of the SW generated by the residents and tourists.

The SW problems can be separated into 3 main issues which are the collection, transportation, and disposal (Kaosol, 2010). Solid waste management (SWM) in Phuket requires the budget of approximately 156 million baht per year (Phuket City Municipality, 2015). However, certain types of waste can be recycled and need not be disposed by the central management system. SWM should begin from the individuals, organizations, and communities because they can be easily controlled and managed. This can help reduce the amount of the SW

¹ These data do not include the population of Phuket Provincial Administrative Organization (PAO), tourists, foreign workers, non-Thai or nonregistered residents

from the individual households and businesses before being collected or disposed in the public bins. Such initiative can be achieved by the effective implementation of an appropriate SWM policy that promotion of recycling and utilization of reusable waste. Currently, the main problem of Phuket SW is the organic waste which makes up about sixty percent of total SW delivered to the incinerator which could have been composted for community use (Phuket Province SWM Center of Phuket City, 2013).

SW volume has increased over the years in many areas of Phuket which can also indicates urban development and economic activities (Figure 1.2). In urban communities such as Phuket CM and Patong Town Municipality (TM), SW volume is high indicating that there are many people and businesses in these areas. However, when calculating the waste production per capita using the public population record Phuket CM residents produce SW at the rate of 0.56 tons per year per person while tourist areas such as Patong TM and Karon SM show production rate of 1.9 and 1.6 tons per year per person respectively. These high rates are likely to result from large number of tourists and tourism workers in the areas. (Figure 1.2)

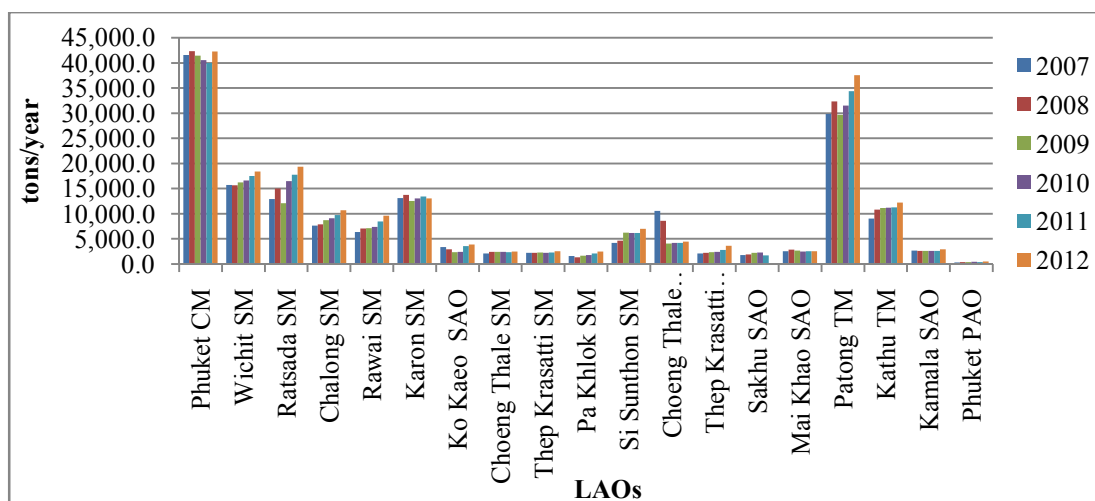


Figure 1.2 The solid waste volume categorized by LAOs ² (Phuket Province SWM Center of Phuket City, 2013)

² These data do not include the waste from private sector and other sources that transport solid waste directly to the incinerator instead of using the service of the LAOs

In the past 10 years, SW that was transported to the incinerator has doubled from 309.6 tons per day in 2002 to over 600 tons per day in 2012 (Figure 1.3). At present, it is estimated that the volume of SW coming into the incinerator is 729 tons per day. Phuket has two incinerators, the first one was built in 1995 and could burn up to 250 tons of SW per day but has currently ceased the operation due to maintenance. In 2008, a new incinerator which can dispose the total of 700 tons of SW per day was built and started operating in 2012 (Phuket province SWM Center of Phuket City, 2013).

Despite the awareness of increasing SW volume by the responsible authorities, effective SWM in Phuket remains a challenge. As LAOs are the key player in waste collection and transport, an understanding of how LAOs manage SW issue is critical for the improvement of SWM in Phuket. This study aims to identify how the LAOs and the community influence SWM effectiveness and propose the strategies that can lead to better management policies.

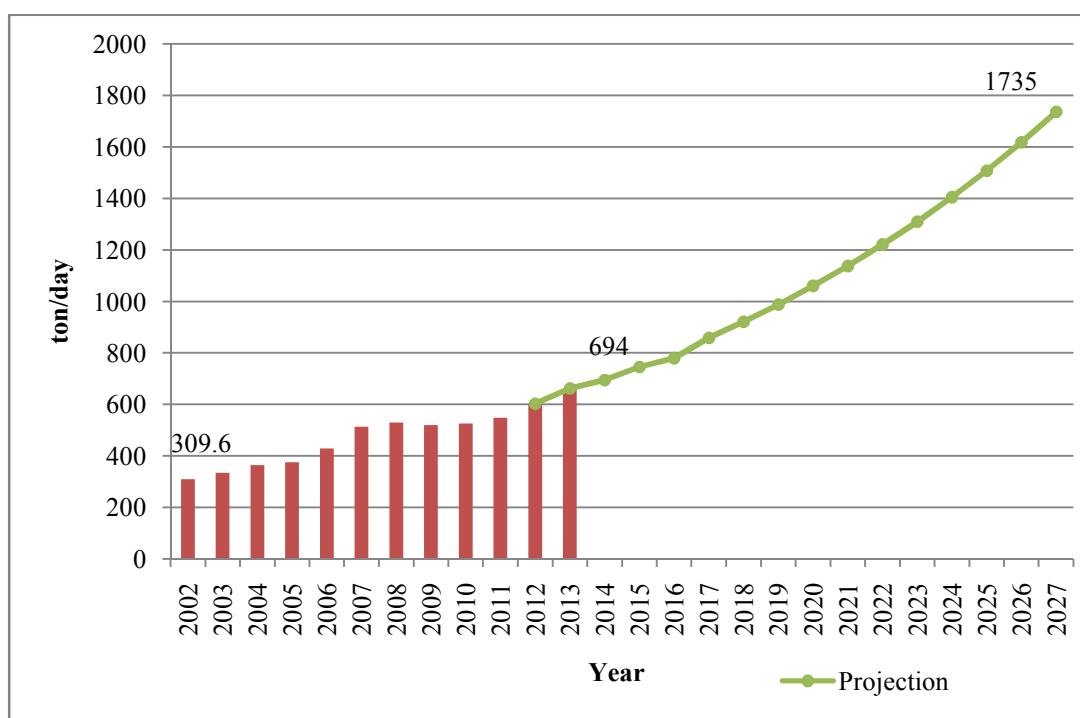


Figure 1.3 Average SW volume from 2002-2013 and the projection from 2014-2027 in Phuket ³
(Phuket Province SWM Center of Phuket City, 2013)

³ The calculation for projection is based on 7.3% increase per year (the rate is calculated from averaging the increase of SW during 1998-2012)

The increase in the population contributes to the increase of SW and put pressure on the SWM of the LAOs. As the budget is based on population number according the house registration, the cost for dealing with waste volume produced by tourists and the hidden population become the additional expense carried by the LAOs and responsible environmental authorities. The SW problems and their contexts vary among the LAOs and shape the SWM strategies. This is a challenge to the people and administrators of Phuket.

1.2 Impacts of solid waste problems in Phuket

1.2.1 Environment

Currently, Phuket focuses on SWM through the disposal in landfill and the incineration. The disposal by landfill can have several negative impacts on both the environment and society if sanitary and safety measures are inadequate (PCD, 2004). This includes the risk of contaminating ground water and soil by the “leachate”, liquid that moves through or drains from a landfill (Salem, *et al.*, 2008). Eventually this will degrade the groundwater quality and affect the people who use the water in such area for consumption.

SW problem has direct impacts on human health and the quality of life of the community. SWM areas in Phuket are often located near the community residential areas, for example, Sapanhin Park. Sapanhin Village has been greatly affected by the disposal process, especially from the smell from waste during its transportation to the incinerator. The trucks used to transport the waste often have leakage and the water from waste drips onto the road surface causing foul smells and health hazard to road users. Occasionally, unpleasant smell also comes from the waste incinerator. Furthermore the wastewater which flows into natural water sources can result in death of natural flora and fauna in freshwater and marine environment.

1.2.2 Society

Having many attractions such as nature-based, historical, and religious places that are scattered throughout the island, tourist visitation is high in Phuket (Tourism

Authority of Thailand, 2013). This also results in high volume of solid waste especially in urban areas such as Patong and Phuket City. As waste from all areas in is transported to the disposal center in Phuket City, congestion and unpleasant odors can affect the local resident quality of life (Sangsintusron, 2007). Waste trucks travel through the residential areas usually between 05.00 AM - 12.00 AM and 7.00 PM - 05.00 AM which can produce bad smell and unsightly scenery. This disrupts the local activities and livelihood and affects the attitudes of the people towards the waste collection workers. This can manifest in negative interactions between the residents and staff of the LAOs who work in SWM. The failure to collect waste on agreed time or the leakage of water from collection trucks can also generate complaints and conflicts in the community.

1.2.3 Economy

Phuket has to spend about 156 million baht per year in SWM (Phuket City Municipality, 2015) instead of using the budget for other development initiatives. Ineffective SWM can lead to loss of income from degraded tourist attractions and health risks from contaminated water and soil from inappropriate waste disposal. Poor waste management can reduce the quality of tourism image and experience in Phuket which affect the decisions for a return visit by tourists. This highlights the importance of addressing. The Phuket SW problem at its root which has become the main goal of this study.

1.3 Objectives

1.3.1 To conceptualize and model the current SWM system in Phuket.

1.3.2 To identifies failure or weaknesses of the current SWM system in Phuket.

1.2.3 To recommends strategies to increase capacity for waste reduction.

1.4 Scope

1.4.1 Examine the communities and organizations which are locally or internationally known for their knowledge in SWM.

1.4.2 Understand the current SWM system in Phuket province.

1.4.3 Understand the role of civil society in supporting SWM in Phuket.

1.5 Expected outcomes

1.5.1 Conceptual model of the current SWM system in Phuket.

1.5.2 Factors contributing to failures or weakness of the current SWM system in Phuket.

1.5.3 Recommendations for effective and appropriate SW reduction at source.

1.6 Research questions

Q1. What is the current SWM system in Phuket?

Q2. How can the participation of the civil society be incorporated in SWM?

Q3. What are the weaknesses of the SWM system in Phuket?

Q4. What are the factors that can improve waste reduction at source in Phuket?

Q5. What are the strategies to increase the capacity for waste reduction?

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Human activities in a modern society have generated many different types of waste. In order to have an effective management of SW, it must be managed at the source (George and Frank, 2002). This can take place in a form of waste separation, reducing consumption and recycling. In this way, the amount of SW that enters the management systems of the community will be less and the disposal can focus on the types of waste that cannot be reused or recycled.

2.2 Current situation of municipal SWM

In order to manage waste effectively, waste sources and their characteristics must be known. The types of waste from different sources are categorized in Table 2.1.

Table 2.1 Sources and types of Solid Wastes in a Community (George and Frank, 2002)

Source	Typical facilities, activities, or locations where waste are generated	Types of solid waste
Residential	Single-family and multi-family dwellings; low, medium and high density apartments	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, tin cans, aluminum, other metal, ashes, plant leaves, special wastes ¹ and household hazardous wastes
Commercial	Stores, restaurants, markets, office buildings, hotels, motels, shops, service stations, auto repair shops	Paper, cardboard, plastics, wood, food wastes, glass, metal wastes, ashes, special wastes, hazardous wastes
Institutional	Schools, hospitals, prisons, governmental centers	Same as for commercial
Industrial (non-process waste)	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, power plants, demolition	Paper, cardboard, plastics, wood, food wastes, glass, metal wastes, ashes, special waste, hazardous wastes

¹ Including bulky items, consumer electronics, white goods, batteries, oil, and tires.

Table 2.1 Sources and types of Solid Wastes in a Community (George and Frank, 2002) (cont.)

Source	Typical facilities, activities, or locations where waste are generated	Types of solid waste
Municipal solid waste*	All of the above	All of the above
Construction and demolition	New construction sites, road repair, renovation sites, razing of buildings, broken pavement	Wood, steel, concrete, dirt
Municipal services (excluding treatment facilities)	Street cleaning, landscaping, catch-basin cleaning, parks and beaches, other recreational areas	Special wastes, street sweepings, tree trimmings general wastes from parks, beaches, and recreational areas
Treatment facilities	Water, wastewater, industrial treatment processes	Treatment plant wastes, residual sledges and other residual materials
Industrial	Construction, fabrication, light and heavy manufacturing, refineries, chemical plants, power plants, demolition	Industrial process wastes, scrap materials, rubbish, ashes, construction wastes, and hazardous waste
Agricultural	Field and row crops, orchards, vineyards, dairies, feedlots, farms	Spoiled food wastes, agricultural wastes, rubbish, and hazardous wastes

* The term municipal solid waste (MSW) is normally assumed to include all of the wastes generated in a community, with the exception of waste generated by municipal services, treatment plants, and industrial and agricultural processes.

From Table 2.1, SW from commercial and institutional organization show similar characteristics. The municipal SW combines all types of waste from the facilities that are in the areas responsible by the local municipalities.

There are many ways to categorize waste. According to Thailand's Pollution Control Department (2012) there are four types of the SW namely compostable waste, recyclable waste, hazardous waste, and general waste. In urban and municipal areas, solid waste is usually classified according to where they are generated from such as human settlements, small industries, commercial and municipal activities household and public areas (Singh, *et al.*, 2011). In this research the classification of waste according to its origin is used as a starting point to explore the SWM system in Phuket.

2.3 Concepts and theories of solid waste management

The problem of SWM has many causes according to different perspectives and activities. Zhang, *et al.* (2010) studied the comparison of municipal SWM in two cities Singapore and Berlin, and described the emphasis on recycling and the involvement of the government and the private sector. They found that, apart from the collection and disposal of solid waste, the transport problem is important for both cities.

A modern integrated perspective for the SWM is now looking beyond the incineration. There are many components of waste problem deriving from the source, separated collection, the station for sorting waste to final destination such as recycling, composting, landfill and incineration. This requires planning which takes into account the transfer stations, the location and the pretreatment stations (Galante, *et al.*, 2010).

Shekdar (2008) studied sustainable SWM using an integrated approach for Asian countries and found that the systems are being oriented to concentrate on the incorporation of 3R

(reduce, reuse and recycle) technologies. These initiatives were geared towards “Zero Waste” and “Zero Land-filling” policy (Figure 2.1).

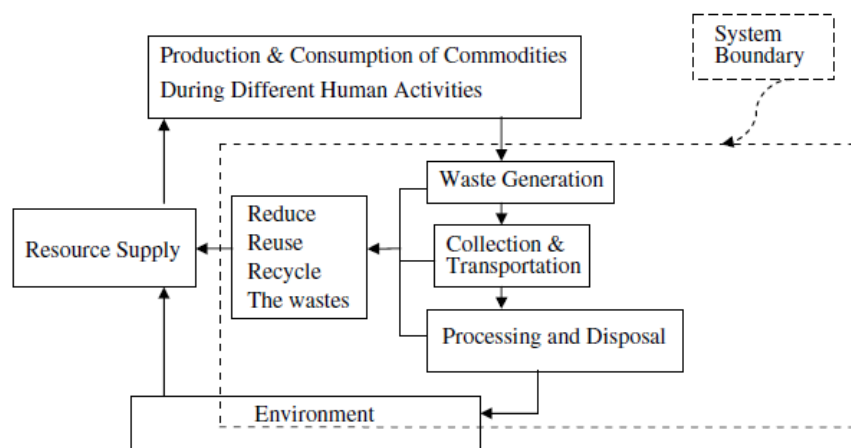


Figure 2.1 The system for sustainable solid waste management (Shekdar, 2009)

As the production and the consumption of the commodities vary with human lifestyles, there are different origins of waste. Waste separation and recycling have been used as strategies to reduce waste before entering the collection and transportation process.

However, the implementation of such strategies also depends on the context of the organizations. This supports the research aims which focus on identifying SWM model in different organization.

2.4 Phuket SWM process

Thai national policies in SWM focus on residual waste management in all provinces which is estimated to be up to 14.97 million tons (Pollution Control Department, 2014).

Currently, there are of 2,490 sites for SW disposal locations nationwide but only 466 sites (19%) comply with the national environmental standard (Pollution Control Department, 2014).

Phuket has one center for solid waste disposal which is managed by Phuket City Municipality under the supervision of the Board of SWM and wastewater of Phuket Province. Figure 2.2 shows the capacity for the management of municipal SW, hazardous waste and infectious waste in Phuket. SW in Phuket is collected and transported by trucks to the treatment and disposal center in Phuket City. All trucks are registered with the center according to the source of waste (LAOs, hotels). After being weighed, the trucks are diverted to the appropriate waste management sites, either the incineration plant or the landfill area (Liamsanguan and Gheewala, 2008). The fee of 520 bath per tons is charged by the Phuket City Municipality for the disposal.

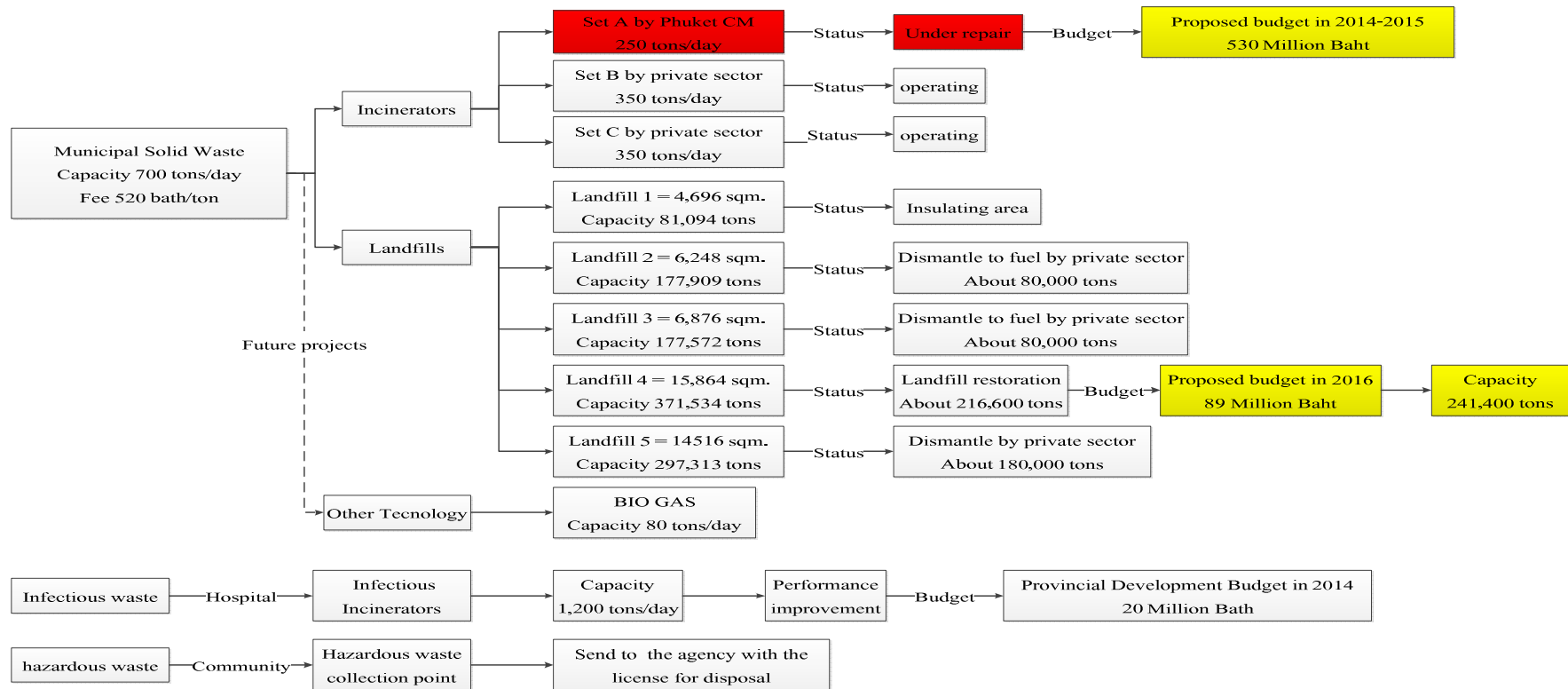


Figure 2.2 The overview of SWM system and the capacity in Phuket (Phuket Province SWM Center of Phuket City, 2014)

Phuket uses two methods for SW disposals which are the incinerators and landfills. The incinerator has three sets of burners: set C and set B together can incinerate 700 tons of solid waste per day. Currently set A is in the process of budget request for repair by the MNRE. There are five landfill cells which are subjected to a renovation order by National Council for Peace and Order (NCPO) under SWM Roadmap in 2014. A proposal for four new landfill cells is put in the budget plan to accommodate 241,400 tons of waste for the next six years (Provincial Environmental Action Plan Meeting, 2015).

The Eleventh National Economic and Social Development Plan (2012-2016) has incorporated SWM for energy and environmental conservation in its policy framework and called for separation of SW at source to reduce the amount of SW transporting into disposal system (Pireeyutma, 2011). This has influenced the SWM policy at provincial level however the success at operation level remains questionable.

2.5 Waste reduction at source

Waste reduction at source can be encouraged by internalizing the cost of SWM which means that pricing the SWM services so that all of the costs are reflected (Gellynck and Verhelst, 2007). For SWM, the costs that need to be internalized include collection and transport, site and construction, administrative and salary, and environmental controls and monitoring (George and Frank, 2002). The community residential committees play important roles in enhancing the public participation and awareness of the importance of waste source separation as well as the cost effectiveness of the system. (Zhuang *et al.*, 2008).

2.5.1 3R concept

3R policy which stands for reduce, reuse, and recycle forms the basis of solid waste management globally (Sakai *et al.*, 2011). Reduction focuses on reducing the volume

and toxicity of the waste. This includes the switch to reusable products and packaging. Consumers can participate by buying less or using products more efficiently (George and Frank, 2002).

Reuse means using an item again after it has been used. This includes conventional reuse where the item is used again for the same function and new-life reuse where it is used for a different function (The Guides Network, 2013).

Recycling is the most commonly practiced activity to reduce waste. Recycling returns raw materials to market by separating reusable products from the rest of the waste stream (George and Frank, 2002). Many materials can be recycled, for example plastic, glass and paper. Recycling reduces the need for landfill and can improve the efficiency and ash quality of the incinerators and composting facilities by removing noncombustible materials, such as metals and glass (Hurst, *et al.*, 2005).

2.5.2 Participation in SWM

Performance of SWM depends on the meaningful participation of the individuals, communities and institutions, producers, NGOs and governments (Squires, 2006). Waste management requires the participation of local community (Sornplang, 2008, Wongputarugsa, *et al.*, 2010) in order to be successful. Singapore presented one of the best examples which incorporated the participation from private sector in the SWM operation. Public sector is responsible for managing SW laws and disposals, while private sector bid for collection operation (National Environment Agency, 2013). The successful bidders are awarded seven-year contracts to manage the collection of recyclable materials from the households. The citizen has a role in waste separation at source which is promoted through the public education. Such model shows that strategic participation of all sectors can contribute to effective SWM under a good governance system.

2.6 Environmental audits for SWM

In order to plan effective SWM, the basic data of the environmental impact must be obtained. The application of environmental audit tools for SWM has been studied by many scholars (Working Group on Environmental Auditing, 2003; Ramachandra and Bachamanda, 2006; Cherubini *et al.*, 2009; Geng, *et al.*, 2010).

SWM is also part of the international standards. Geng, *et al.*(2010) evaluated an innovative waste management initiative in Kawasaki by a scenario simulation model based on the Life Cycle Analysis (LCA) approach. The results showed that recycling mixed paper, mixed plastics, and organic waste and utilizing the recycled materials in the industrial production will potentially reduce waste from the organizations. By using LCA, the waste generation processes can be identified (Cherubini, *et al.*, 2009).

At local level, SEEK Phuket² (2013) identified effective SWM as part of the indicators for Phuket sustainability. Its goal was that “Phuket becomes a clean Zero waste island by 2025” and suggested two types of sustainability indicators on SWM topic. These are the total amount of waste generated (tons) per capita, and the total amount of waste recycled (SEEK Phuket, 2013).

Several studies also highlighted the importance of laws and governance in managing waste. Vanapruk (2012) concluded that legislation was key for effective SWM. The findings were drawn from the in-depth interviews with senior managers in MNRE and Directors of Regional Environment Offices. The study concluded that there is a need for a central organization that is responsible for policy planning, making laws and monitoring LAOs so that SWM is conducted using the same standard across the province.

² SEEK stands for Society Environment Economy Knowledge. It is civil society organization setup to work with the local community, the local government, the private sector and the residents of Phuket to communicate and keep Phuket a leading sustainable destination for the future (SEEK, 2013).

The policy of a central body to manage SW is similar to the initiative proposed in Malaysia Where the Solid Waste and Public Cleansing Management Act was established in 2007 to transfer the responsibility of SWM from local authorities to central government and set up a new organization to improve the effectiveness of collection, recycling and disposal system across the country (UNDP, 2008). However, this remains a challenge at implementation level. Most ASEAN countries do not have a clear legislative framework for waste management while the public sector mandated with such responsibilities are not clearly defined and often lack resources, financing, technologies, capacity and skills for SWM (Uyen and Hans, 2009).

In practice, changes at all levels are required to improve the local governance in SWM. In the study by Maria and Umanto (2010), the need to adjust the roles of different actors at different levels was highlighted. Integrated SWM system should be adopted at policy level while legislation must be enforced to empower responsible the authorities to work optimally at organizational level, and the public participation system should be established to facilitate the operation in reality. This is supported by the study of Martin (2010) in the Greater Accra Metropolitan Area in Ghana which found that the success of SWM depend on acceptability and participation from the public and private sector. Failures of SWM system are frequently caused by the authorities lacking the capacity and commitment, the contractors being unable to provide regular service delivery and the consumers not willing to pay for inefficient services (Martin 2010).

This chapter has demonstrated that understanding the contexts in which SWM is operated at local level is crucial for identifying the weaknesses in the system and the ways to improve capacity for SW reduction in reality.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology used in this research. Overall processes can be categorized into five steps (Figure 3.1). It started with the conceptualization of SWM framework in Phuket and later, identified weaknesses of the current SWM framework. It included policy analysis and the monitoring of SWM initiatives of the civil society. It concluded with the analysis and synthesis of the data.

3.2 Research design

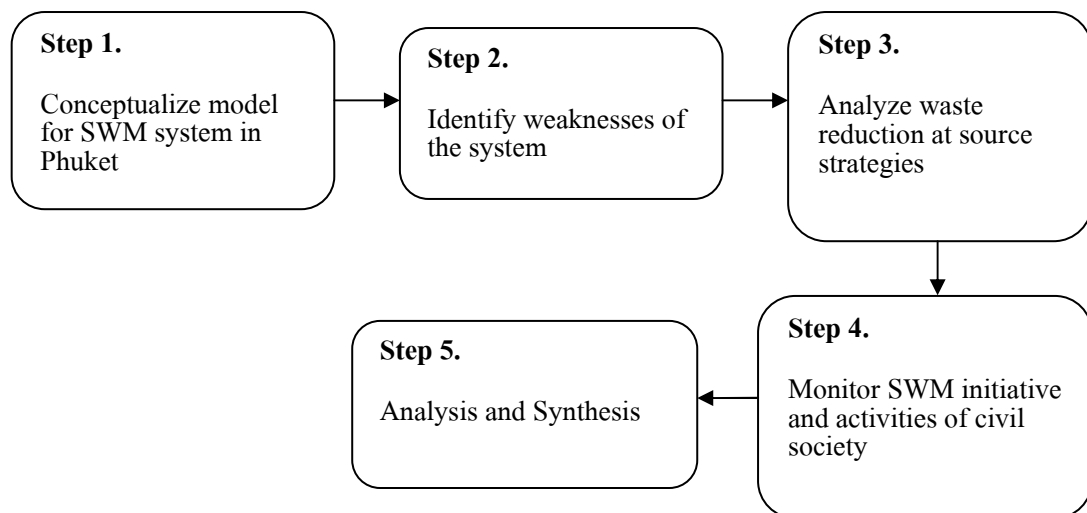


Figure 3.1 The research process

Step 1. Conceptualize model for SWM system in Phuket

This step studied current situation for SWM in Phuket. This step explored the policy, collection details, transport or processes that occur in SWM. The analysis of the data in this stage contributed to the development of a SWM model for Phuket. It involved observation and gathering of the secondary as well as some primary data. Interviews were conducted with stakeholders that were responsible for waste management. Open-ended questions were used in the interviews. Secondary data was collected from the document and reports which were relevant to solid waste management in Phuket from the government, private sector, and civil society. Using data from the interviews and the documents, the model was conceptualized. The results were presented to stakeholders and participants in order to test for accuracy and gain feedback.

Step 2. Identify weaknesses of the system

At this stage, enabling factors and barriers of the SWM system were identified. This was achieved through the analysis of the desktop research, interviews with 19 LAOs and stakeholders, field observation and inputs from the public meetings. Table 3.1 shows the 41 meetings attended by the researcher during the study.

Table 3.1 The meetings and events attended by the researcher

No.	Date	Month	Activities	Responsible agencies
Year2013				
1	25	November	SEEK Phuket Indicator meeting	SEEK Phuket
2	2	December	Study trip with NEV-Net (2-7 December 2013)	Phuket PAO

Table 3.1 The meetings and events attended by the researcher (cont.)

No.	Date	Month	Activities	Responsible agencies
Year 2014				
3	14	January	Environment and Energy Learning Park public hearing	Phuket CM
4	3	March	Environment and Energy Learning Park public hearing	Phuket CM
5	30	January	EIA for composting plant public hearing	Phuket PAO
6	6	February	Board of SWM and wastewater of Phuket Province (1/2014) meeting	Phuket Office Of Natural Resources and Environment (ONRE) Phuket Province
7	12	February	NEV-Net meeting	ONRE Phuket
8	20	February	Conservation and save Andaman project southern coast group meeting (Ranong, Krabi, Phang Nga, Phuket and Trang).	ONRE Phuket
9	12	March	NEV-Net meeting	ONRE Phuket
10	14	March	EIA Composting plant public hearing	Phuket PAO
11	14	May	NEV-Net meeting	ONRE Phuket
12	21	March	Board of Phuket Environmental Foundation meeting	Phuket Environmental Foundation

Table 3.1 The meetings and events attended by the researcher (cont.)

No.	Date	Month	Activities	Responsible agencies
Year 2014				
13	12	June	NEV-Net meeting	ONRE Phuket
14	16	June	Working group for the SWM in Phuket meeting (1/2014)	ONRE Phuket
15	3	September	Household compost bin project meeting at Bangwan community	PSU Phuket
16	12	September	Activity in schools of Phuket PAO at Ban Na Bon school	Phuket PAO
17	13	September	Activity in schools of Phuket PAO at Royal Phuket City Hotel	Phuket PAO
18	16	September	Phuket sustainable waste management technology learning center opening ceremony	Phuket CM
19	17	September	Activity in schools of Phuket PAO at Maireab School	Phuket PAO
20	20	September	Meeting between Patong TM and Prince of Songkla University (PSU), Phuket Campus	Patong TM and PSU Phuket
21	29	September	Board of SWM and wastewater of Phuket Province meeting (3/2014)	ONRE Phuket
22	3	October	Household compost bin project monitoring at Bangwan community	PSU Phuket
23	9	October	NEV-Net meeting	Phuket ONRE
24	15	October	Kathu TM meeting Environmental program in school	Dr Peter W. Harris

Table 3.1 The meetings and events attended by the researcher (cont.)

No.	Date	Month	Activities	Responsible agencies
	Year 2014			
25	16	October	Meeting with the working group of local experts to prepare SWM master plan	ONRE Phuket
26	4	November	"Clean City for National Happiness " Project	Phuket CM
27	7	November	Workshop on reducing organic waste in household	Researcher
28	12	November	Board of SWM and wastewater of Phuket meeting (4/2014)	ONRE Phuket
29	13	November	Conservation and save Andaman project, southern coast group meeting (Ranong, Krabi, Phang Nga, Phuket and Trang).	ONRE Phuket
30	19	November	NEV-Net meeting	ONRE Phuket
31	25	November	Clean City project meeting	ONRE Phuket and NEV-Net
32	27	November	Working group for the SWM in Phuket meeting (2/2014)	
33	28	November	Workshop on bio-fermentation and organic compost	ONRE Phuket and Phuket Environmental Foundation
34	30	November	Clean City Project meeting	ONRE Phuket and NEV-Net

Table 3.1 The meetings and events attended by the researcher (cont.)

No.	Date	Month	Activities	Responsible agencies
Year 2014				
35	4	December	Clean City Project activity	ONRE Phuket and NEV-Net
36	18	December	Board of SWM and wastewater of Phuket Province meeting (5/2014)	ONRE Phuket
Year 2015				
37	11	January	Study trip activities with NEV-Net (11-17 January 2015)	Phuket PAO
38	28	January	NEV-Net meeting	ONRE Phuket
39	26	February	Meeting to receive feedback from stakeholders draft the SWM National Act at Surat Thani Province	PCD
40	12	March	Observation of Eco-school in Ban Na Bon school Project	Nabon school
41	1	May	Provincial Environment Action Plan meeting (1/2015)	ONRE Phuket

Step 3. Analyze waste reduction at source strategies

This stage selected a waste reduction initiative from the LAOs that had active SWM strategies. The selection was made from the organization that has been publicly accepted with a good environmental practice at the local level. Observations and consultation with related personnel in the LAOs were conducted. Participants were recruited and interviewed

during 41 meetings using open-ended questions. Data from this step was used to further refine a SWM model and the analysis of gaps in the system.

Step 4. Monitoring SWM initiative and activities of civil society

This step monitors a SWM activity implemented in the study area. At the time of the study the local organization promoted “Household compost bin project” as a way to reduce organic waste from entering the SW stream. This was therefore incorporated into the research to monitor the process and the result of this initiative in reality. The researcher facilitated the workshop for disseminating the information to the participants and followed up the progress monthly. The result was used to analyze the strengths and weaknesses of such program and suggest improvement.

Step 5. Analysis and Synthesis

Data from the previous steps were analyzed to address the research questions. Additional data were obtained through desktop research and expert consultations to fill the gaps where possible.

3.3 The study area

Phuket is in the south of Thailand and has an area of 576 square kilometers. There are three districts with a total registered population of 380,768 and 11,960,044 tourists (Ministry of Tourism and Sports, 2015). The study area in this covers the entire Phuket Province which comprises 19 LAOs. This is based on the categorization of local governance into three major categories. A provincial administrative organization is the highest authority in terms of local management of the province (Provincial Administration Act, 2540 B.E. (1997)).

Municipality can be further divided into three types namely city municipality, town municipality and sub-district municipality (Municipal Act, 2496 B.E. (1953)). Sub-district administrative organization looks after the sub-district areas (Sub-district Council and Sub-district Administration Organization Act, 2537 B.E. (1994)). Phuket LAOs comprise of one Province Administrative Organization (PAO), one City Municipality (CM), two Town Municipalities (TM), nine Sub-district Municipalities (SM), and six Sub-district Administrative Organizations (SAO) (Figure 3.2). Phuket Province Administrative Organization is not labeled as it does not have a clear physical boundary because the organization oversees the whole province rather than a specific location.

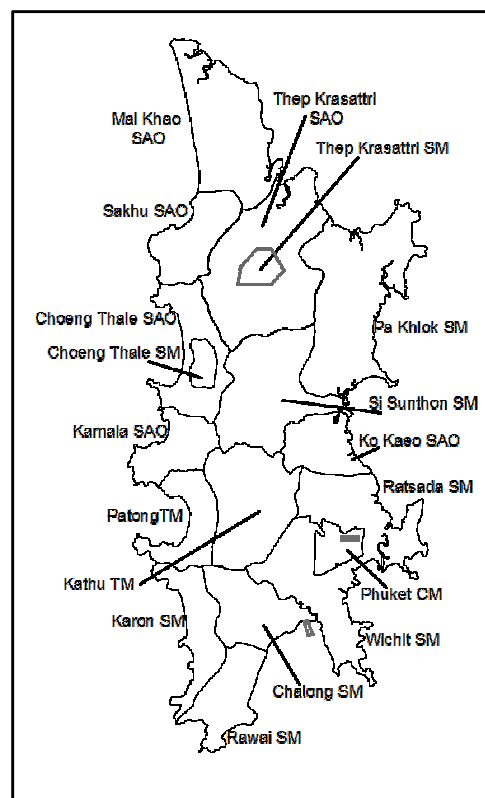


Figure 3.2 The boundary of LAOs in Phuket

3.4 Research tools

3.4.1 Interviews

The format of the interviews used was semi-structured, open-ended questions (DiCicco-Bloom and Crabtree, 2006). The participants in the interviews came from the following sectors.

- 1) Leaders of the organizations or community which have solid waste management policy.
- 2) Department or unit responsible for solid waste management in the local administrative organizations (LAOs) in Phuket. This helped recruiting information of the waste management system in the organization including current and future plan and actions.
- 3) Staff in the organization or members in the community. This gained the opinions of people in the community about the current SWM and the future they would like to be as well as the behavior in SWM.
- 4) Civil society and community groups. This provided the insights into the attitudes of the people in local community towards the work of local of the government in SWM.

3.4.2 Observation

The observation is collected using an audio recorder and field notes to observe the behaviors of the people in the meetings, workshops and SWM initiatives.

3.4.3 Desktop research.

Materials such as planning documents, meeting minutes, reports, news articles, and websites were sought after and used to analyze the patterns of activities for SWM in different organizations.

3.4.4 Participation in local SWM activities

Local meetings at the provincial and local levels were attended in order to gain insights into the participation processes, SWM problems and roles of each sector in Phuket SWM. The researcher participated in the activities of the organizations such as the local administrative organizations. The researcher also established a connection with ONRE Phuket which helped gain news about meetings and activities in Phuket. This allowed the researcher to join in almost every meeting relevant to SWM that was organized by the local authorities and built good relationships with them. In term of volunteer groups such as Nev-Net, the researcher established a connection through an expert and participated in all their meetings. This strengthened the connection with the community groups and enabled the researcher to observe and take part in their activities.

This led to the selection of the case study, “Household compost bin”, which was initiated by Phuket CM. The activity aimed to reduce organic waste in a household by turning organic waste into compost. The researcher was involved in monitoring and evaluating the cooperation of the population in this activity.

3.5 Analysis

The information obtained from the interviews, observations, desktop research and participations in local activities were analyzed using content analysis method (Elo, *et al.*,

2014). The result provided inputs for the conceptualization of SWM Model for Phuket. Data analysis followed the qualitative approach to allow the real situations to be analyzed and formulated into identifiable patterns (Robson, 2005; Boonchai, 2012). Conceptual categories were derived to reveal factors influencing the concept of SWM in Phuket. The findings from each step contributed to the resolutions of the research questions and provided insights into the strategies for reducing solid waste at source.

CHAPTER 4

SWM SYSTEM IN PHUKET

This chapter presents the overall system of SWM in Phuket. The chapter describes the legislative framework, national and local SWM policy, and the current SWM system in Phuket. Data from interviews with officials from 19 LAOs and members of the communities and civil society groups are reported and analyzed to identify the weaknesses in the system and improvement measures. The chapter provides resolutions for research questions 1 to 3.

4.1 Thailand SWM Framework

Thailand has several legislations that relate to SWM. This section discusses Thai laws which contribute to the roles and responsibilities in SWM at local level.

4.1.1 SWM Laws

Laws relating to SWM can be divided into two groups: one addressing the cleanliness of the area and the other assigning the responsible authorities for SWM (Table 4.1).

Table 4.1 The Thai legislations that are related to SWM

Name	Detail	Implication
Cleanliness		
Public Health Act 2535 B.E. (1992)	SW (General waste, hazardous waste, infectious waste) and disposal	<p>The local government is responsible for the following tasks:</p> <ol style="list-style-type: none"> 1. Ensure that SW is not left in public area 2. Provide bins in public and private locations 3. Establish appropriate approaches for collection, transport and disposal of SW 4. Identify service fees within limits stated by the Ministry 5. Identify criteria and conditions for collection, transport and disposal for the licensed contractors and high level staff.
Promotion of National Environmental Quality Act 2535 B.E. (1992).	Plan and budget (Environmental Fund)	<p>Local authority is to establish an operation plan for reducing pollution in a pollution control area and present to the governor.</p> <p>Owner of the pollution sources has a duty to collect data and make a report to the local authority to be sent to pollution control official at least once a month.</p> <p>Local authority has the power and duty to collect service fees, fines and compensations for the issues that related to public waste water management system or waste management system.</p> <p>Environmental foundation: For local authorities to be used for investment in SWM system such as purchase of land, tools, and equipments for the operation and maintenance. For loan to local authorities to establish waste management system for the operation within its jurisdiction.</p>

Table 4.1 The Thai legislations that are related to SWM (cont.)

Name	Detail	Implication
Cleanliness		
Cleanliness and tidiness of the Town houses Act 2535 B.E.(1992)	Fee, public cleanliness and authority of employees	Local authorities have the power and duty to: <ol style="list-style-type: none"> 1. Create public awareness about their duty according to the Act 2. Monitor and control the violation of the Act 3. Give warning to a violator 4. Arrest the violator and proceed with a lawsuit 5. Local authority officials who neglect their duty will be treated as a violator
Assigning responsible authorities for waste management		
Municipal Act 2496 B.E. (1953)	Management and budget	Municipalities have the power to issue local laws that do not conflict with national laws Municipalities have the duty to manage solid waste which includes maintaining clean streets and public walkways as well as disposing waste.
Sub-district Council and Sub-district Administration Organization Act B.E. 2537 (1994)	Management and budget	The authority is divided into 2 parts: <ol style="list-style-type: none"> 1. Sub-district councils have the authority to develop the area according to their plan and budget and present to the authorities for example maintaining the drainage, keeping roads, water ways, walkways and public areas clean, as well as disposing waste. 2. The power and duty of the sub-district administrative organizations in keeping roads, water ways, walkways and public areas clean, as well as disposing waste.

Table 4.1 The Thai legislations that are related to SWM (cont.)

Name	Detail	Implication
Provincial Administration Act, B.E. 2540 (1997)	Management and budget	The duty of the provincial administrative authority to operate within its jurisdiction such as collaborate with sub-district councils and other authorities, issue local laws and collect fees for public services.
Decentralization to Local Government Act B.E. 2542 (1999)	Management and budget	Municipalities and sub-district organizations has the power and duty to manage the public service system within their jurisdiction such as SW and sewage management, promote public participation in the development of the area, manage the environment and pollution and collaborate with other local administrative organizations.

The first category of the laws focuses on cleanliness of the town and the responsibility of the government officials to plan, promote and implement cleaning activity including waste collection, transportation and disposal. The second category of the legislation identifies the responsible authorities for waste management which mainly states that LAOs have the authority to operate waste collection, transportation and disposal of SW in their area. Despite the multiple regulations and formal assignment of responsibilities, the gaps exist in the standard of the implementation and law enforcement. For example, the responsible authorities often lack personnel with appropriate expertise related to environmental problem solving, and have limited authority to manage the problems (Chamnanya, 2012).

In the case of Phuket, this is evident as 19 LAOs decided on their own policies on how to deal with waste after collection. They also often face similar problems due to the lack of personnel and budget. This is discussed further in section 4.4.1.

4.1.2 SWM Policies and responsibilities

The Ministry of Natural Resources and Environment (MNRE) has the direct responsibility for SWM in Thailand. At national level, there is a Board of SWM which is facilitated by MNRE. At regional level, SWM is the responsibility of relevant offices of the ministries such as the MNRE, Ministry of Interior and Ministry of Energy. At provincial level, there is a committee of the Board of SWM for each province with the responsibility for policy in accordance to each region of the province.

In Phuket, the Board of SWM and wastewater has been established since 2005 (Figure 4.1).

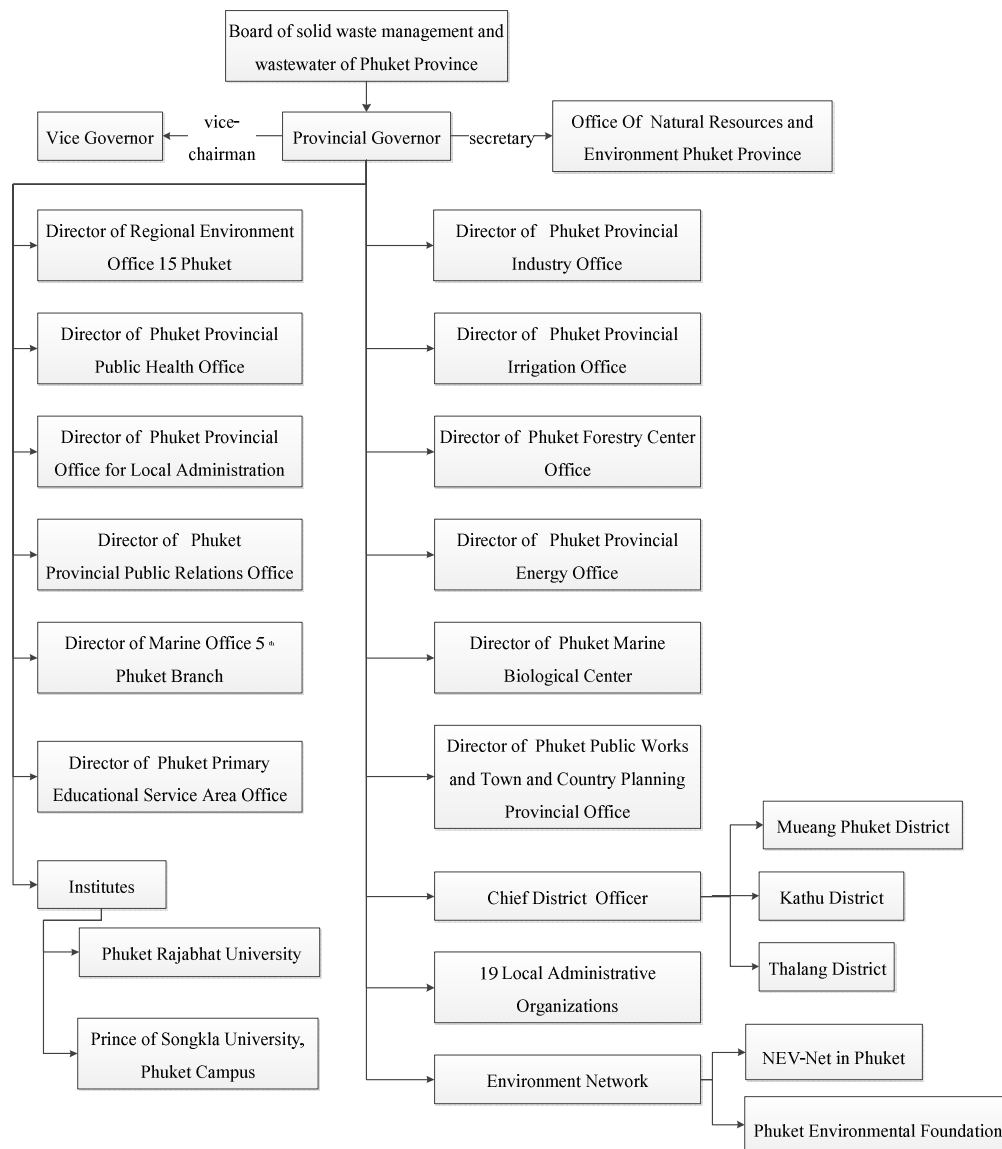


Figure 4.1 The Board of SWM and wastewater of Phuket Province

The Board of SWM and wastewater of Phuket Province has the Governor as the chairman and ONRE Phuket as the secretary. The role of this board is to establish policies, initiate discussion to resolve problems and plan for the future. The committees meet every three months to monitor the policies or discuss problems that are common to all sectors. For example in 2014, there was a policy on hazardous waste. The board made an announcement to all LAOs to

separate hazardous waste from general waste and assign Phuket CM as the collection point for hazardous waste which was to be disposed appropriately by Phuket PAO.

Although there was an official notice issued to all LAOs to collect hazardous waste and deliver them to the collection site in Phuket CM during the 20-25th of each month, the field observation showed that hazardous waste such as light bulbs were still disposed in the general waste bins. When the community members were asked about the notice, they did not know about it and were not informed to separate the hazardous waste. The LAOs were also observed with low level of readiness to implement this strategy as one officer stated that *“the municipality does not have the location to store the waste and the standard for collecting them is high, for example, we need to wrap the light bulbs to prevent breakage during the delivery to Phuket CM”*. Furthermore, the issue of hazardous waste has not come up in any subsequent meetings attended by the researcher which shows low attention and monitoring effort in this issue. The LAOs were not pressured to address this problem seriously and sometimes were observed to mix hazardous waste with general waste during the collection.

Ideally, the meeting of this board is supposed to be attended by 19 LAOs. However, in 2014 most of the LAOs did not attend the meetings except Phuket CM and Wichit SM which were active in SWM. Absence from the meetings did not incur any consequences to the LAOs and the meeting minutes would be sent to all. Although the problem of low participation has been alerted and that the director of the board has requested the attendance by all LAOs to these meetings, there has been no change. This shows the lack of enthusiasm in SWM issues by the LAOs.

4.1.3 SWM Roadmap in 2014

The SWM Roadmap was introduced by NCPO in 2014 as a result of the change of government (Table 4.2).

Table 4.2 The SWM Roadmap in 2014

Topic	Urgent (6 months)	Medium term (1 year)	Long term (>1 year)
1. Disposal of old SW	<ol style="list-style-type: none"> 1. Survey 2. Evaluate 3. Renovate old disposal sites 4. Close or change the waste disposal sites that do not comply with the environmental standard 5. Promote private investment 		
	Target area 6 provinces Target: Reduce to 11.05 million tones of accumulated waste from 28 million tons	Target area 20 provinces. Target: Reduce to 11.40 million tones of accumulated waste 28 million tons	Target area 47 provinces. Target: Reduce to 2.5 million tones of accumulated waste 28 million tons

Table 4.2 The SWM Roadmap in 2014 (cont.)

Topic	Urgent (6 months)	Medium term (1 year)	Long term (>1 year)
<p>2. Create a model for SWM and hazardous waste (new solid waste)</p> <ul style="list-style-type: none"> - Focus on reduction at source - SWM Center - Waste to energy 	<p>Model L : Phuket</p> <p>Waste volume 300 tons / day or more</p> <ol style="list-style-type: none"> 1. Separation of waste at source 2. Separation of hazardous waste and collection at a place center in the province which is to be sent for to private sector disposal 3. Creating an integrated a SWM system and turn waste into energy 4. Renovate landfill to increase the duration of use 		
	<p>Model M</p> <p>Waste volume 50-300 tons / day</p> <ol style="list-style-type: none"> 1. Separation of waste at source 2. Separation of hazardous waste and collection at a place center in the province which is to be sent for to private sector disposal 3. Creating an integrated a SWM system and turn waste into energy 4. Renovate landfill to increase the duration of use 		

Table 4.2 The SWM Roadmap in 2014 (cont.)

Topic	Urgent (6 months)	Medium term (1 year)	Long term (>1 year)
<p>2. Create a model for SWM and hazardous waste (new solid waste)</p> <ul style="list-style-type: none"> - Focus on reduction at source - SWM Center - Waste to energy 	<p>Model S</p> <p>Waste volume less than 50 tons / day:</p> <ol style="list-style-type: none"> 1. Separation of waste at source 2. Separation of hazardous waste and collection to a place center in the province which is to be sent to private sector for disposal 3. Creating an integrated SWM system and turn waste into energy 4. Providing a collection service of hazardous waste and sent to a center in the province 5. Promote private investment 		
<p>3. To issue rules waste management and hazardous waste.</p>	<ol style="list-style-type: none"> 1. Provincial governor controls the LAOs 2. Establish SWM committee, provincial governor is the president based on the authority of MNRE 	<ol style="list-style-type: none"> 1. Establish permit system 2. Extended producer responsibility 3. Define the rules for recycled materials in production and packaging 	<ol style="list-style-type: none"> 1. Implement local law on waste separation 2. Establish legislation on Waste Electrical and Electronic Equipment - (WEEE), Extended Producer Responsibility: (EPR) and product charge

Table 4.2 The SWM Roadmap in 2014 (cont.)

Topic	Urgent (6 months)	Medium term (1 year)	Long term (>1 year)
3. To issue rules waste management and hazardous waste.	3. Create SWM master plan 4. Edit law for Promote private investment 5. Establish regulations to set fees and standards for the collection, transport 6. Establish rules for the monitoring system and operation of waste disposal 7. Establish local law on waste separation	4. Prepare the measures to prevent illegal dumping hazardous industrial waste 5. Promote the treatment / disposal / recycling 6. Establish local law on waste separation 7. Propose centralized legislation to implement the SWM in the country	

Table 4.2 The SWM Roadmap in 2014 (cont.)

Topic	Urgent (6 months)	Medium term (1 year)	Long term (>1 year)
<p>4. Establish the discipline of the nation towards sustainable management.</p> <ul style="list-style-type: none"> - To educate the public - Law enforcement 	<ol style="list-style-type: none"> 1. Check and take legal actions against illegal waste disposal 2. Provide knowledge, public relation campaign to increase awareness and participation 3. Create awareness and the discipline in the SWM in youth 	<ol style="list-style-type: none"> 1. Check and take legal actions against illegal waste disposal 2. Control and register the junk shops 4. Provide knowledge, public relation campaign to increase awareness and participation 3. Create awareness and the discipline in SWM in youth 	<ol style="list-style-type: none"> 1. Check and take legal actions against illegal waste disposal 2. Control and register the junk shops 5. Provide knowledge, public relation campaign to increase awareness and participation 3. Create awareness and the discipline in SWM in youth

The SWM Roadmap in 2014 has four major components: managing old solid waste in disposal sites, creating a model of SWM and hazardous waste (new SW), issuing rules for waste and hazardous waste management and establishing the disciplines in the nation towards sustainable management. It is further divided into three periods, the immediate term (six months), the medium term (one year) and the long term (one year). The model for management is also divided into three levels of small (S), medium (M) and large (L) waste volume. The SWM Roadmap in 2014 identified areas for actions by the urgency of the crisis in the province, the need for regulations to control management, the standard of operation and, the importance of creating awareness in the nation through children and youth education.

As a result of the SWM Roadmap in 2014, many relevant authorities became more active in SWM. While the SWM Roadmap in 2014 provides the direction and goals for SWM, the framework for operation requires the participation from local authorities and volunteers to create an appropriate and practical action plan. There an increasing awareness in the existence of volunteer groups

such as NEV-Net. A meeting to create SWM master plan and strategies for action at provincial level was initiated. The existing knowledge and technology from the local institutions such as the Phuket Environmental Foundation is publicized and adopted. This is because SW is considered “a national problem” and is widely discussed at all levels of the governance and in the media. When people and institutions become aware of the problems, they contribute to the support to solve problems.

4.1.4 The SWM Master plan at provincial level

In 2007, Phuket and the MNRE, Ministry of Energy and Office of the National Economic and Social Development proposed Phuket SWM Plan to the Cabinet. This

plan was to serve as a framework for the preparation of the SWM action plan of the relevant authorities. A task was assigned to the Ministry of Interior to provide funding for projects which would be under the responsibility of local government (Department of Environmental Quality Promotion, 2007).

In 2014, Phuket SWM Master Plan was re-initiated. The plan was used as a model for the national SWM Roadmap in 2014. The focus of the plan was to separate the waste at source and manage hazardous waste. This was used as a framework to guide SWM practices in Phuket and had been subjected to multiple discussions to make it an effective action plan (Provincial Environmental Action Plan Meeting, 2015).

In 2015, the creation of Phuket Environment Action Plan was facilitated by Phuket ONRE. The focus of the plan was to consolidate the SWM plans from all LAOs and apply for funding from MNRE. For financial year 2017, two projects were proposed. They are the renovation of the old landfills by Phuket CM and Bio Gas Project by Phuket PAO. A possible explanation for low numbers of project proposals by the LAOs can be that the projects under this funding scheme would receive budget from National Environmental Foundation which requires continuous monitoring and can generate a lot of work for LAOs (Provincial Environmental Plan Meeting, 2015).

4.2 Phuket SWM system in reality

This section reports the findings from the interviews with 19 LAO representatives which occupied 31 hours of interview data and observation notes from 40 meetings of various civil society groups on environment and waste issues. The data were analyzed contextually using open coding (Robson, 2011). This provides the understanding of the

SWM system in Phuket in practice which is explained in this section. This data help resolve research question 1 which focuses on the current SWM system in Phuket.

4.2.1 Evolution of Phuket SWM

The SWM system in Phuket was formally established in 1993 and there have been many changes since then (Figure 4.2).

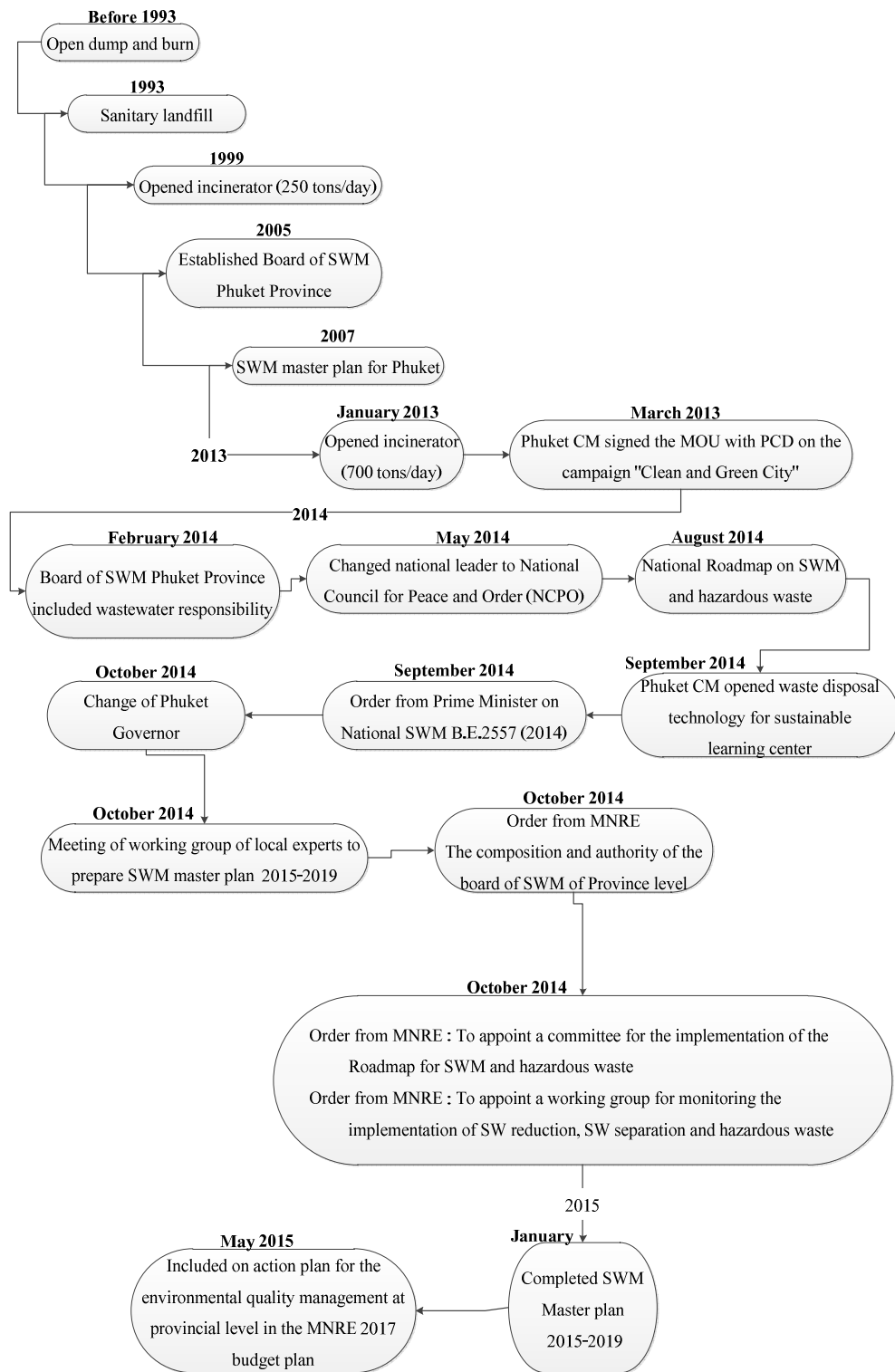


Figure 4.2 The timeline of major changes in Phuket SWM

Waste disposal in Phuket was originally assigned to Sapanhin area in Phuket CM which has the area of 41.5 hectare for open dump. Currently the area has been developed into a sport stadium, parks and recreation areas. The waste disposal center was constructed in 1992 by Phuket province and Phuket CM with the support of the Department of Public Works and Town Planning as part of a master plan for a proper waste disposal system. In 1995 the construction of an incinerator which has the capacity of 250 tons per day began. In 2014 the second incinerator with the capacity of 700 tons per day started its operation which is managed by a private sector.

In terms of administration, Board of SWM of Phuket was established in 2005. This board was revised and reinstated in 2014. Although Phuket had proposed its SWM master plan to the Cabinet since 2007, little progress had been made. The changed in 2014 when there was a strong push to set up SWM Roadmap in 2014 by NPCO which ordered all provinces to create a SWM Master plan for 2015-2019 and an action plan in 2017 for the environmental quality management at the provincial level.

SWM in Phuket has evolved continuously from the establishment of the SWM Board in 2005 and the proposal of Phuket SWM master plan in 2007. However, the implementation of the plan was limited. A public official explained the reason for this as *“the old plan was not taken seriously and there was no responsible staff for the operation so it was not mentioned or implemented”*. This is perceived differently for the 2014 Phuket SWM master plan which is responsible by ONRE Phuket. There is also an increase in the authority and the role of the board which included the issue of wastewater as part of the responsibility of the SWM and wastewater management board. This allows the problems of SW and wastewater to be managed concurrently. Nevertheless, the effectiveness of these institutions and policies depend on the awareness of the relevant authorities and the public about the severity of the problems, their level of commitment and their cooperation in implementing changes.

4.2.2 SWM conceptual model

Phuket SWM system at operation level can be conceptualized in three parts (Figure 4.3). Part 1 shows the decentralization of responsibility from the central to regional government where the Ministry of Interior supervises the Department of Local Administration and the Provincial Governor oversees the local governance in the province (Part 1). At provincial level, Phuket Provincial Office for Local Administration administers 19 LAOs under the regulations of Ministry of Interior. In terms of SWM policies, there is the Board of SWM and wastewater of Phuket Province which is chaired by the Phuket Governor and attended by 19 LAOs as well as representatives from Phuket Environmental Foundation, civil society and relevant regional governmental bodies. The role of the board is to set up the framework and policy to guide the management of SW and wastewater in the province. Although the MOU on SWM signed in 2008 stated that the LAOs should collect and transport waste to the disposal center run by Phuket CM, the success of such collaboration depends on the capacity and policy of each LAO. The effectiveness of SWM policies vary with the context of the areas and the structure of the LAOs. Most LAOs have in their organizational structure a unit responsible for SWM under the Public Health and Environment Department, except Phuket PAO and Phuket CM. Phuket PAO put this responsibility with the Technical Department Phuket CM divides this responsibility between the Public Health and Environment Department which looks after policy, collection and transport, and the Technical Department which takes care of the disposal center that has the incinerator and landfills. Consequently, the governmental officials who have the responsibility on SWM are in different positions. For example, LAOs might have an Environmental Officer or a Sanitation Technical Officer depending on their organizational structure. This remains true even after the change of governance in 2014. The only difference is that there are frameworks and plans that provide a clearer goal and direction for SWM operations.

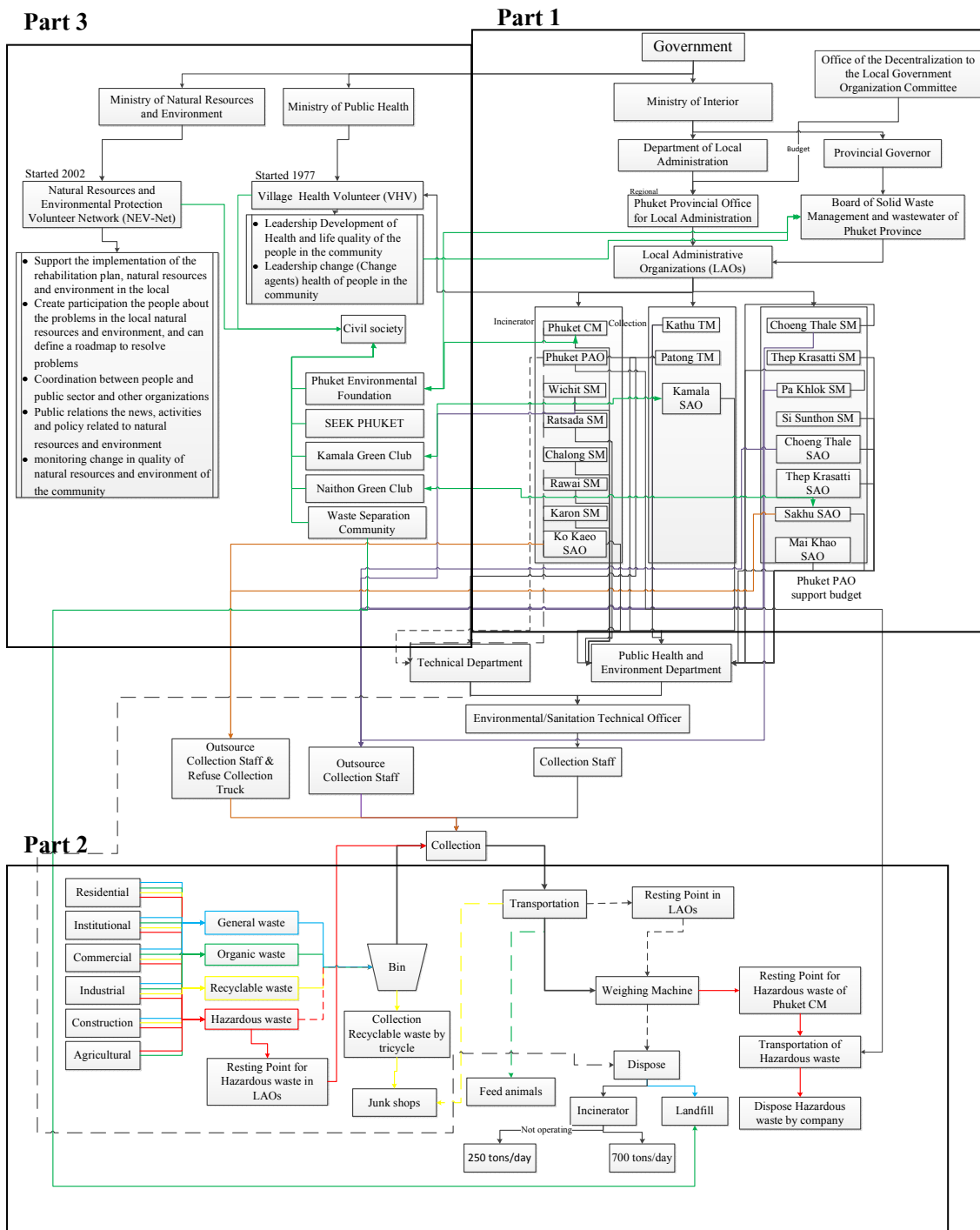


Figure 4.3 The conceptual model of current SWM system in Phuket

The second part of the SWM system shows the overall picture of the SW sources such as residential, institutional, commercial, industrial, construction and agricultural areas (Part 2). SW from these sources is generally classified into four types namely general waste, organic waste, recyclable waste and hazardous waste. However, in practice all SW types are currently put into the same bin without separation. Although some LAOs namely Phuket CM has initiated waste separation project to sort out hazardous waste such as batteries and light bulbs, its success has been limited and these items were still seen in the bin with general waste. This is despite the fact that the Board of SWM and wastewater of Phuket Province has issued a policy on separation of hazardous waste and demanded that all LAOs have a collection point for hazardous waste in the local areas before transporting these items to the hazardous waste collection point at Phuket CM for disposal.

SW in the bins may also get separated informally by the recyclers who sell recyclable waste to junk shops and recycling companies or by the collection staff employed by the LAOs. The LAOs are in charge of SW collection and transport. SW that is transported to the disposal center in Phuket CM is subjected to the fee of 520 baht per ton. While this generates income to Phuket CM, the cost of SW disposal and staffing currently exceeds the revenue.

The third part of the system displays the role of civil society in SWM in Phuket (Part 3). This group comprises the individuals from a variety of careers and demographic. There are people who work in both public and private sectors who come together and create groups in order to conserve the environment and work with the authorities to address environmental issues. There are many examples of such groups. For example, Phuket Environmental Foundation has been active as the center for coordination between public and private sectors as well as the dissemination of knowledge to the partners. SEEK (Society, Environment, Economy and Knowledge) Phuket is led by expatriates who regularly organize sustainability dialogues, beach cleaning and CSR activities. Kamala Green Club is a group of

residents and hotel businesses in the Kamala area which aim to maintain clean environment and establish waste separation project. Naithon Green Club is influenced by an establishment the Kamala Green Club with the aim to improve the environment in Naithon beach. Waste Separation Community and Natural Resources and Environmental Protection Volunteer Network (NEV-Net) are groups of people in the community working under the supervision of the ONRE Phuket to help care for the environment in the community and facilitate local government projects such as waste separation, recycling, waste bank and composting. Village Health Volunteer (VHV) is mostly the same people as NEV-Net doing similar activities, with the difference that VHV works under the LAOs.

Part of the SWM problem is caused by multiple organizations having overlapping yet unclear roles under different jurisdictions. As a result, the authority to enforce the laws is not effective, the work is redundant and there is a lack of integration in the solutions that are implemented by each group or organization.

4.2.3 Phuket SWM strategies at local level

Different SWM strategies are employed by 19 LAOs in Phuket. This is shown in Figure 4.4.

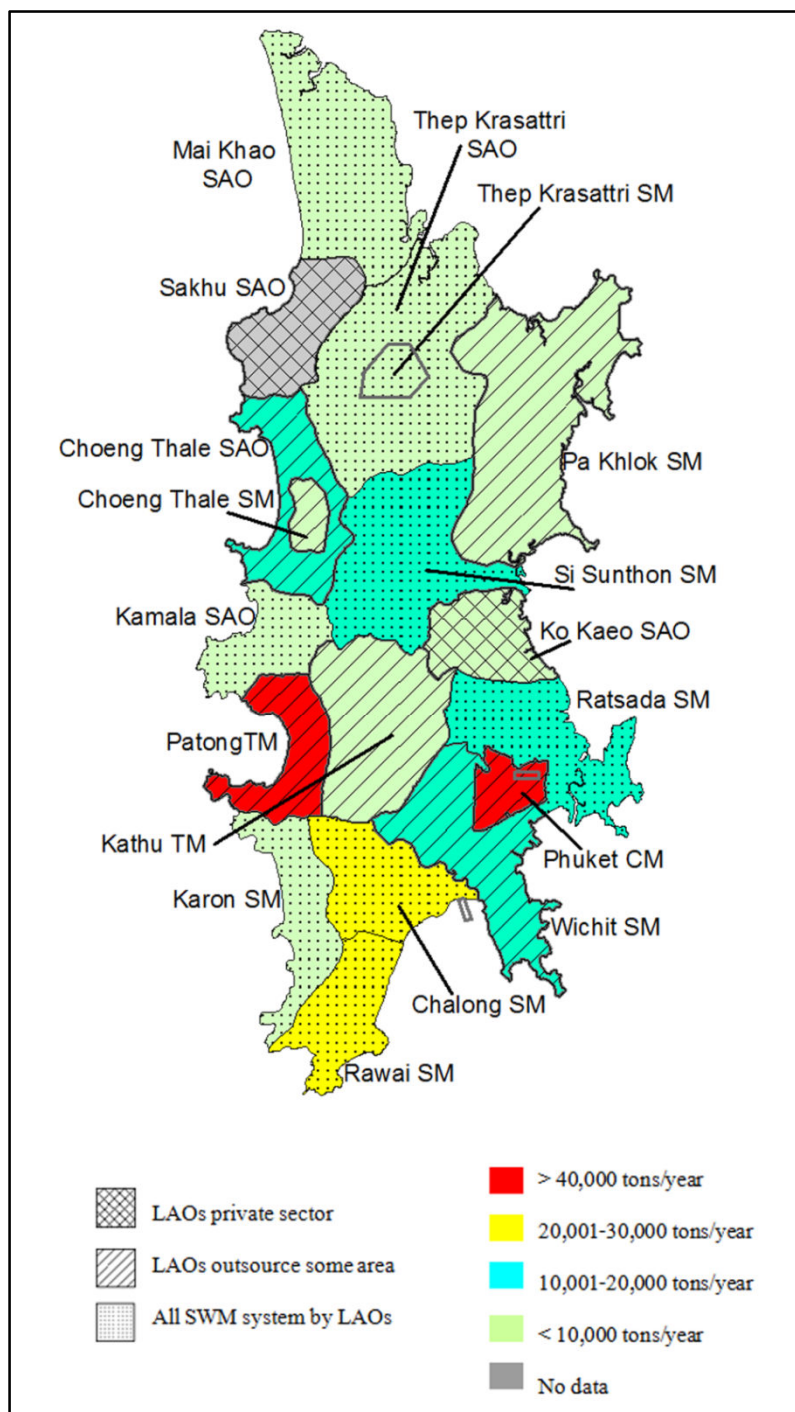


Figure 4.4 The SWM strategies adopted by Phuket LAOs¹

¹ Phuket PAO manages SW by itself but is not shown in the map due to the lack of clear physical boundary of its jurisdiction

The three SWM strategies adopted by the LAOs are i) employing full-time collection staff and transport by LAOs vehicles, ii) outsource collection staff to private company while using transport by LAOs vehicles and iii) outsource both collection staff and transport vehicles to private company.

Most LAOs use self management strategy especially those with medium SW volumes (10,000 - 30,000 tons/year). LAOs with large area and high SW volumes tend to use partial outsource strategy. The complete outsource strategy is selected by two LAOs, Ko Kaeo SAO and Sakhu SAO to reduce cost for management and maintenance. The different SWM strategies are chosen based on context of the areas and the SWM policy by LAO leaders (Table 4.3).

Table 4.3. The summary of the SWM strategies according to Phuket LAOs in 2014

Self management	Partial outsource	Complete outsource
1. Phuket PAO	1. Phuket CM	1. Ko Kaeo SAO
2. Ratsada SM	2. Wichit SM	2. Sakhu SAO
3. Chalong SM	3. Choeng Thale SM	
4. Rawai SM	4. Pa Khlok SM	
5. Karon SM	5. Choeng Thale SAO	
6. Thep Krasatti SM	6. Kathu TM	
7. Si Sunthon SM	7. Patong TM	
8. Thep Krasatti SAO		
9. Mai Khao SAO		
10. Kamala SAO		

From 19 LAOs, ten manage SW by themselves (Table 4.3). The common reason for using this method is the convenience in control and cooperation for new requests or urgent tasks, and high level of commitment between the organization and staff. There are five LAOs that employ partial outsource strategy. Their main justifications for this method are large areas and the need to resolve complaints of overflowing SW. Only two LAOs fully outsource SW collection staff and transport vehicle to private sector. Their reasons to reducing cost of operation and complaints about the uncollected SW. The viewpoint that LAOs are only responsible for moving the SW outside of their own areas is very strong in these two areas as shown in the quote by an officer from Sakhu SAO.

“Sakhu SAO is in the northern part of the island with the distance of a round trip for transporting waste to the disposal center of over 60 kms. So Sakhu SAO outsources collection staff and transport vehicles to a private sector using a three month contract. The private company can dispose the waste using any methods that do not affect Sakhu SAO. Then we do not have to worry about staff and complaints.”

The differences in the strategies of waste collection and transport have been the result of different policies of the LAO leaders. However the efficiency of SWM in these local areas is questionable and outsourcing the operation to private sector needs to be implemented with transparency as there is a high opportunity for corruption. In theory, the operations using outsource strategy should follow the Public Health Act 2535 B.E. (1992). However, it is not clear how monitoring and enforcement is conducted and who is checking this.

As different the LAOs are given the responsibility to manage SW by themselves using their own budget, their decisions to manage SW vary with their contexts and the perceptions of the LAO directors. The factors that influence the decision for adopting different strategies include area size, population, type of waste, industry, livelihood, political environment, management capacity, and level of participation. This can be seen from Patong TM which stated

that *“SWM has two parts: the management by themselves and the private sector to help in waste collection since it (Municipality) needs to cover all areas on the same day and avoid residual waste.”* Others made decisions based on the reduction of complaints as displayed in this quote, *“Ratsada SM changed from managing by themselves to outsourcing to a private sector to reduce complaints from the public.”*

Several LAOs chose to outsource their SWM operations to private sector to reduce the cost for example, *“Ko Kaeo SAO uses private sector to manage all processes such as waste collection vehicle and staff, because it reduces the cost of maintenance and employment problems.”*

While outsourcing SWM to a private sector is seen convenient to the LAOs, the strategy is seen problematic by others as it transfers SW problems to other areas rather than solving them. It also provides the opportunities for illegal dumping of the SW in both public and private land. Without the control or monitoring of the operation standard, companies may cut cost by not disposing waste properly. Therefore, there must be a control measure against illegal dumping or disposal of SW to prevent pollution and health hazard from improper waste disposal. This is evident in Wichit SM where waste is dumped in a vacant land by a private contractor. As the SWM outsource contract did not specify where the waste should be treated, it provided the gap for the operators to cut corners and dump waste anywhere as long as they are not reported. Although there is a Public Health Act 2535 B.E. (1992) which gives authority to local officials to prosecute violators who dump waste in public areas, it is not usually enforced. This also shows negligence and ineffectiveness of the LAOs and local law enforcement on SW issues. The positive and negative impacts of current SWM strategies of Phuket LAOs are summarized in Table 4.4.

Table 4.4 The strengths and weaknesses of current Phuket SWM strategies

Phuket LAOs SWM strategies	Strengths	Weaknesses
Self management	<ol style="list-style-type: none"> 1. Control is based on SWM policies of LAOs 2. LAOs understand problems in area 	<ol style="list-style-type: none"> 1. Lack collection staff 2. High cost of maintenance 3. Unable to collect SW in some areas
Partial outsource	<ol style="list-style-type: none"> 1. Collection covers all area 2. Resolve the lack of staff 3. Reduce complaints 	<ol style="list-style-type: none"> 1. High risk of corruption 2. Operators may not have a good standard of operation
Complete outsource	<ol style="list-style-type: none"> 1. Save cost for maintenance 2. Resolve the lack of staff 	<ol style="list-style-type: none"> 1. The disposal method is not controlled 2. High risk of corruption 3. LAOs cannot control the operation standard 4. Operators may not have a good standard of operation

Self management strategy used when the LAO leaders consider that they have the capacity to manage the SWM operation by themselves. In addition, some LAOs such as Ratsada SM and Chalong SM used self-management strategy in attempt to compare its effectiveness against the partial outsource strategy in order to find the right strategy that can reduce the public complaints in their areas. Weaknesses of the self management strategy are mainly the lack of collection staff and the inability to collect the waste quickly which can result in the waste overflow in some areas.

Partial outsource strategy is often used in areas which have a lot of SW such as Phuket CM and Patong TM to help resolve the issue of the lack of collection staff. However, this strategy has the weakness in the standard for selecting the private sector to operate

collection of SW. Although the LAOs can outsource the operation of public services under the Private Investment in State Undertakings Act 2556 B.E. (2012), they do not have the capacity to enforce a clear standard and conduct monitoring to control the quality of these operations. This highlights the need for the provincial Board of SWM and wastewater of Phuket Province to control the standard of SWM outsourcing.

The complete outsource strategy has the strengths in saving the cost of maintenance and resolving the problem of staff shortage. But the weaknesses of this strategy are the risk of corruption and inability of the LAOs to control the SWM processes. For example, the SW from Sakhu SAO is not sent to the incinerator after collection which raises the suspicion of where about the waste is disposed and how much has been collected (Figure 4.4).

There has been no uniform standard and criteria to evaluate the effectiveness and appropriateness of the SWM strategies by Phuket PAO. Although the private sector has a role in operating the SWM, this is different from Singapore model where the private sector competitively bid for the waste collection which is separated types and is monitored rigorously (National Environment Agency, 2013).

4.3 The civil society and SWM in Phuket

This section describes the roles of civil society in Phuket SWM. The investigation into the participation of civil society in Phuket SWM provides resolutions for research question 2.

4.3.1 Phuket SWM volunteers

There are four major groups of community volunteers and active environment associations in Phuket (Tables 4.5).

Table 4.5 The SWM volunteers in Phuket

Natural Resources and Environmental Protection Volunteer Network (NEV-Net)	Village Health Volunteer (VHV)	Green club	Phuket Environmental Foundation
<ol style="list-style-type: none"> 1. Set up by PCD 2. Supported by ONRE Phuket 3. Work in a village or district 4. Have a committee in a province 5. Focus on SWM and oversee the order in the community 6. Have a leader in each district 7. Have official registration 8. Have an annual convention at national level 9. Membership covers every district in Phuket. 10. Increase collaboration between the public and private sectors 	<ol style="list-style-type: none"> 1. Set up by the Ministry of Health 2. Lead changes in health behavior, introduce knowledge 3. Have a committee in a province 4. Have official registration 5. Have an annual convention at national level 6. Membership covers every district in Phuket 7. Increase collaboration between the public and private sectors 	<ol style="list-style-type: none"> 1. Set up by a group of individuals and private sector 2. Work at village level 3. Focus on sorting waste in the community 4. Originate from a collaboration between the public and private sectors. 5. Has a clear leader 6. Has a strong working group 	<ol style="list-style-type: none"> 1. Combination of public sector and the public sector 2. Collaboration between the public sector, private sector and civil society 3. Resolve waste problems 4. Work with various agencies 5. Act as a collection of knowledge and networking

These groups comprise of community members, volunteers and civil society groups which were active in SWM activities in Phuket. NEV-Net was set up to help monitor the environmental conditions at village level and voice out the problems on the community behalf. The main activities of this group include participation in the events organized by the public sector, increasing public awareness about the existence of the group, and leading learning activities and the establishment of learning centers in the area. For example, the SWM learning center in Thalang area was created by the NEV-Net group. Interestingly most people in NEV-Net are also in the VHV group. VHVs mainly monitor the health of the people in their villages and provide knowledge such as waste separation and the benefits of an effective microorganism (EM) ball. Green clubs were initiated by the gathering of the community members and businesses who have the same goals and desires in environmental conservation. For example, Kamala Green Club and Naithon Green Club were initiated to strengthen the effort for addressing the environmental problems in these areas. The groups recruit funds from various channels such as the contribution of local businesses. The publicity of this group is not yet widespread as there is no official support for their activities and they work based on of voluntary partnerships. The last group is Phuket Environmental Foundation which represents the association of civil society, business representatives and public officers. The foundation facilitates the collaboration between volunteer groups and governmental agents on environmental activities in Phuket. The strengths and weaknesses of these volunteer groups are summarized in Table 4.6.

Table 4.6 The strengths and weaknesses of SWM volunteers

Volunteer Groups	Strengths	Weaknesses
NEV-Net	<ol style="list-style-type: none"> 1. Formally established. 2. Registered with government agency 3. Attractive to volunteers 4. Active 	<ol style="list-style-type: none"> 1. Lack of teamwork 2. Not understanding their roles 3. Members have multiple roles /work for several agencies 4. Old people are the majority 5. Do not want to work unless an incentive is present 6. No plan and lack of leadership
VHV	<ol style="list-style-type: none"> 1. Formally established 2. Registered with a government agencies 3. Long establishment 4. Clear understanding of their own roles 5. Strong leadership 6. Report to LAOs 	<ol style="list-style-type: none"> 1. Members have many roles / work for several agencies 2. Old people are the majority
Green club	<ol style="list-style-type: none"> 1. Organized by people in the community 2. Strong leadership 3. Understand the problems in the community well and are solution-oriented 4. High acceptance from the community 5. Coordinate well with both the public and private sectors 	<ol style="list-style-type: none"> 1. Only set up in some areas 2. Lack publicity and do not many members 3. Not supported by government 4. There is no clear work plan
Phuket Environmental Foundation	<ol style="list-style-type: none"> 1. A clear team structure 2. Supported by the government, private sector and civil society 3. Receive budget from various channels 	<ol style="list-style-type: none"> 1. Based on volunteers who have multiple roles 2. Does not have clear plan

The strengths of the volunteer groups mainly come from the community ownership and support from the governmental and private organizations. This is because most members are local people who have grown up in the area and experienced the changes in their communities. This is expressed by one Green Club member.

“I love and want to protect the natural resources in my hometown because I see it since I was a child and I want to keep it for my children and grandchildren. People from outsiders exploit and destroy the resources and culture in the area and leave once there is nothing left to take. We, the local people have to take care of the mess and solve problems. At first people think we are crazy for doing all these but now they see that we really do it for the community” (Kamala Green Club member).

These groups demonstrate the ability to understand the community issues and recruit people to take part in the decision making and problem solving. It is observed that strong communities are often the ones that build on the inherent strengths and capacities of the people in the area. The governmental agency can benefit from putting more focus on supporting SWM participation from these community groups and developing them to be a model for public – private collaboration in SWM.

4.3.2 The SWM learning centers by the communities

There are several learning centers by the communities in Phuket both formal and informal establishments. The accumulation of knowledge in these areas is based on the context of the communities. Figure 4.5 some locations of the learning centers which have been mentioned by the informants and during the meetings. Many of these centers are in the municipal areas and are the result of the collaboration among civil society groups, largely led by the Phuket Environmental Foundation. The learning centers often began with an individual or an organization in the community who has great knowledge about a particular topic that others often

refer to and ask for consultation. The examples of well-known learning centers for waste in are Vachira Phuket Hospital and Phuket Royal City Hotel. The former represents a public organization while the latter provides a model for hotel businesses.

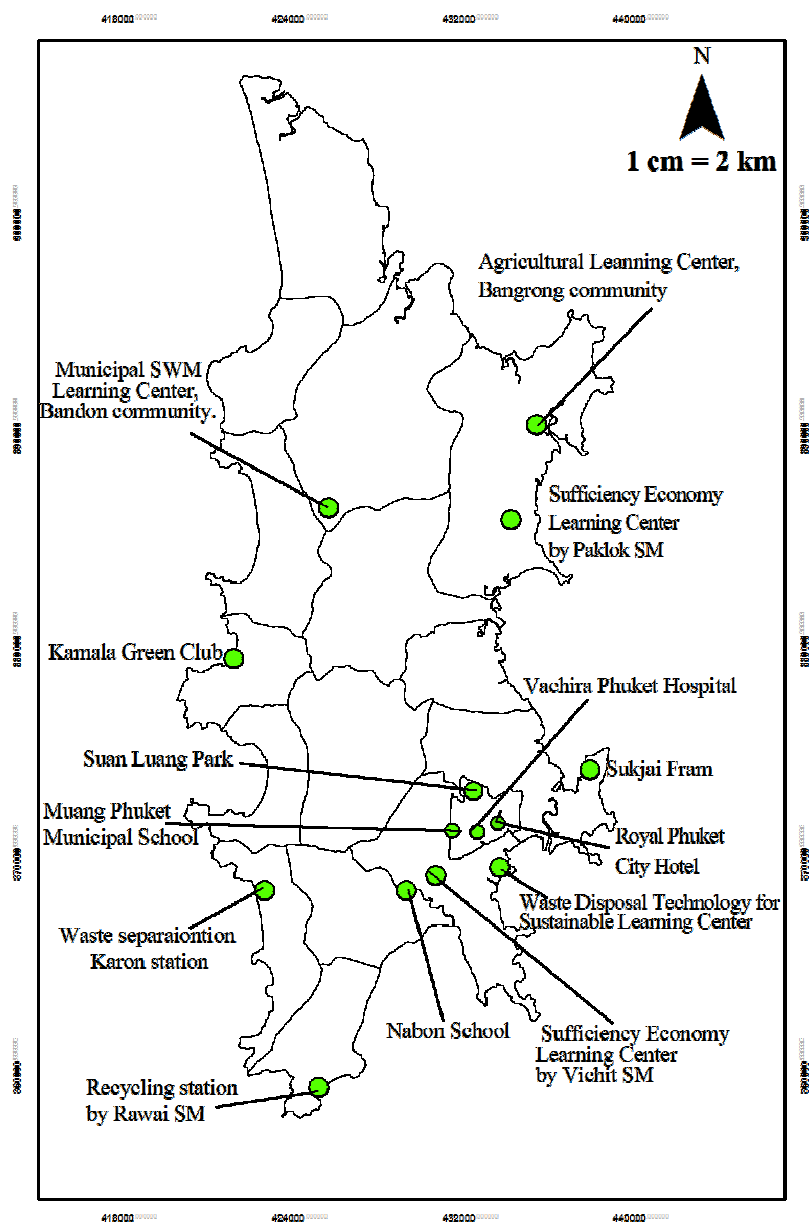


Figure 4.5 The SWM Learning centers in Phuket (February 2015)

Although the presence of these learning centers shows the potential in knowledge and capacity of the communities, they do not guarantee the continuity and sustainability of these operations. Many become inactive due to the lack of human resources, systematic implementation plan and financial support. Despite the knowledge and skills to be shared, the learning centers were often incapable to effectively communicate update information to the public. One major problem is that these centers were not designed to be self-funded and self-managed. In order to be useful, improvement of information and innovative communication approach is necessary.

SWM learning centers in Phuket have been created by many agents such as public sector, private sector and the communities. The centers originated from the cooperation of the LAOs and Phuket Environmental Foundation are the waste Disposal Technology for Sustainable Learning Center (Phuket CM), Sufficiency Economy Learning Center (Wichit SM), Sufficiency Economy Learning Center (Paklok SM), Waste separation (Karon SM) and Recycling station (Rawai SM). However, some of them are currently not operating because of the lack of human resources to manage the centers. Another example from public sector is Vachira Phuket Hospital which is a model of a successful organization in environmental and energy management. At school level, Nabon School and Muang Phuket Municipal School have SWM learning centers and set up an environmental club of students with the supervision of teachers. Nabon School was also modeled as an eco-school and received an award from the Department of Environmental Quality Promotion. These schools are the result of the collaboration between Phuket Environmental Foundation and schools.

For private sector, Royal Phuket City Hotel is considered a successful organization for good environmental management in hotel sector. This is mainly attributed to the importance of environmental management in the organization culture and the collaboration with Phuket Environmental Foundation which facilitates the transfer of knowledge in SWM. The hotel

has shown good environmental practices in many environmental aspects and transferred knowledge to many other organizations. Another learning center by the private business is Sukjai Farm which offers the opportunity for people to visit and learn about its environmental management in agricultural operations.

Civil society and people in the communities also have also set up the learning centers with the cooperation of government agencies and Phuket Environmental Foundation. The examples include the Municipal SWM Learning Center in Bandon community and Agricultural learning center in Bangrong community. There has been a plan to set up such learning center in every district in Phuket which is to be funded by Phuket PAO and Phuket ONRE and managed by NEV-Net in the areas.

Phuket Environmental Foundation has been the key factor in transferring knowledge to create and support many of the SWM learning centers. However, whether the learning centers succeed or not depends on the cooperation and the strengths of the teamwork to manage the activities and funding in these centers. The sustainability of these operations requires the understanding of the problems and linking the available supports to address these problems.

4.4 The weaknesses of the SWM system in Phuket

This section identifies the weaknesses of SWM in Phuket. In doing so, it addresses the research question 3.

4.4.1 SWM issues stated by LAOs

From the interviews with LAOs, several issues in managing SW were mentioned and the extent to which the problems are acknowledged by the local authority is shown in Table 4.7.

Table 4.7 The problems of SWM mentioned by 19 LAOs

No.	Issues	% of 19 LAOs stating the issue
	Policy	
1	Waste collection fee	5.26
2	Bins distribution	10.53
3	Corruption and politics	10.53
4	Organization structure	5.26
5	Discontinuation of policy for SW projects	26.32
6	SW separation project	10.53
7	Personnel issue (Administration and cleaning staff)	68.42
8	Waste collection schedule	21.05
	Collection	
9	Residual solid waste	10.53
10	Transit time to the incinerator	10.53
11	Not enough trucks, old trucks, damaged trucks	31.58
12	Large area	21.05
13	Position of the bins	10.53
14	Separate collection of organic waste	5.26

Table 4.7 The problems of SWM mentioned by 19 LAOs (cont.)

No.	Issues	% of 19 LAOs stating the issue
SW Characteristics		
15	Illegal dumping	57.89
16	Fishing debris and foams	5.26
17	Construction waste and large items	10.53
18	Agricultural waste and shrimp farms	15.79
19	Waste from boats	15.79
20	Infectious waste	5.26
21	Waste from the sea	15.79
Population		
22	Bias against collection staff	21.05
23	Increasing population and the housing estates	26.32
24	Lack of volunteers	5.26
25	Urban lifestyles	10.53
Other		
26	Construction camps	15.79
27	Hotels have good SWM	5.26

The most frequently stated issue by LAO officers relate to the policy especially the lack of personnel (68.42%) to collect SW and monitor SWM effectiveness. The lack of personnel is talked about by 13 LAOs, most are the LAOs that manage SW by themselves. High turnover of the collection staff was also mentioned. This problem is captured in the

statement by the officer from Karon SM that *“most people join work with Karon SM not for a long time because when the hotels call for workers the staff will resign from our organization so Karon SM has to find new collection staff.”* Interestingly, Kamala SAO stated that it has enough staff and trucks to collect SW in the area as it can recruit temporary workers through cooperation with the community. This is unique as other LAOs cannot resolve the problem in the lack collection staff in the same way as Kamala SAO.

Other factors such as area size, increasing SW and negative attitudes of the residents can also exacerbate the staff shortage. In Ratsada SM which has a large area and high growth of population, SW overflow is stated as a major problem in the area. Ratsada SM had previously outsourced collection staff to private sector but had to change to manage SW by themselves in 2014 due to the difficulty in payment to the contractor. The officer in Ratsada SM explained the reason for staff shortage that *“the collection staff has to work under pressure and a negative attitude towards them so people are tired of the work and this is the cause for resignation.”* For Thep Krasatti SAO and Ko Kaeo SAO, the shortage of staff for the collection was not as important as the shortage of environmental officer who have knowledge in SWM.

The next most mentioned issue is collection. Ten LAOs (57.89 %) talked about illegal dumping of SW in their areas which was suspected to be by conducted private sector. This problem is summarized by an officer from Si Sunthon SM.

“Si Sunthon SM has the main road for transporting SW from many LAOs to the incinerator. The illegal dumping occurs at night after the collection trucks run past. You can see the evidence on the main road before the heroine monument. Currently the local authority receives complaints from the people, this must be resolved.”

Meanwhile, Ratsada SM and Wichit SM showed a different illegal dumping problem. The waste that was illegally dumped in their areas were characterized by waste from construction sites and from the private sector which conducted the SW collection for hotels.

The lack of collection vehicles (31.58 % of LAOs) was also mentioned in conjunction with the lack of personnel. This is summarized by Wichit SM officer that *“the collection vehicle is broken frequently. As a result, waste is overflow in many areas especially on small roads. The collection staff cannot collect waste in time as Wichit SM has a large area, so this is a main problem for our local area.”*

Although the SWM problems that were most mentioned relate to the lack of personnel, illegal SW dumping and collection vehicle problems, this is not conclusive and further investigation into the viewpoints of other stakeholders outside of the governmental authorities is required.

The gaps in the awareness of SWM problems by LAO officers are evident. For example, the three year development plan of many LAOs mentioned waste separation project but this topic was not discussed during the in-depth interviews with the LAO officers. Such discrepancy between the policies and what practitioners pay attention to raises the question of the extent to which the plan is implemented, monitored or evaluated. However, after the reform by the SWM Roadmap in 2014, the SWM strategy focuses more on waste separation at source. Gaining cooperation by all agencies especially the LAOs is likely to require the shift in the mindsets of practitioners and officers at operational level.

4.4.2 The SWM issues from the civil society perspectives

This section presents the views of the community members, volunteers and civil society associations towards the SWM in Phuket. Supplementary information of SWM from the Phuket community was retrieved from the content analysis of 40 gatherings which amount to over 150 hours of discussions and study trips. The main informants are from Phuket NEV-Nets and individuals working with Phuket PAO. Recurrent themes and topics discussed in these gatherings are summarized in Table 4.8.

Table 4.8 The problems of SWM mentioned by civil society

Issues	Example quotes from the participants
Policy	<p><i>"LAOs should be serious about having a SWM policy "</i></p> <p><i>"LAOs should have a waste reduction at source policy "</i></p> <p><i>"LAOs should provide equipments for waste separation"</i></p> <p><i>"The waste fees should be based on SW volume"</i></p> <p><i>"Promote awareness activities specifically in the youth and do it seriously."</i></p> <p><i>"LAOs should provide recycling policy".</i></p>
Personnel	<p><i>"Thai people do not want to work as a garbage collector, so the employees are foreign workers."</i></p> <p><i>"The quality of life of waste collection staff should be improved. Give them uniform and increase safety."</i></p> <p><i>"Collection employees work is not clean."</i></p>
Collection	<p><i>"Collection trucks left stinking leakage in the residential areas."</i></p> <p><i>"Collection truck is bad quality."</i></p> <p><i>"Collection time should be the same for all areas in Phuket."</i></p> <p><i>"Separate general waste and recycling trucks."</i></p>
SW types	<p><i>"There is no place for dumping big waste such as branches, sofas and beds."</i></p> <p><i>"Provide the place for organic waste in each LAO for making compost to be used in the community."</i></p>

Table 4.8 The problems of SWM mentioned by civil society (cont.)

Issues	Example quotes from the participants
Participation	<p><i>"The community should be involved in proposing SWM to LAOs."</i></p> <p><i>"The internal conflicts prevent the participation of the community."</i></p> <p><i>"There should be a support for volunteer groups such as NEV-Net and VHV."</i></p> <p><i>"Promote activities to the public better, should use all channels, particularly through community leaders and village headmen."</i></p>
Other	<p><i>"Should provide sufficient bins to match the volume of waste in the area."</i></p> <p><i>"The bin distribution should be based on the volume of waste in the area and the activities, not just give them to friends and relatives of the officers."</i></p>

The issues that were most mentioned include waste reduction and separation at source. Waste separation at source was discussed in several meetings attended by the representatives from various organizations and volunteer groups. The participants to these meetings included members of the Board of SWM and wastewater of Phuket Province, ONRE Phuket, Organic Fertilizer and Energy Center of Phuket PAO, Energy and Environment Learning Park of Phuket CM and Phuket NEV-Net. These discussions highlight the importance of waste separation at source in order to reduce SW volume before and to increase the efficiency of the incinerator. Composting organic waste is especially mentioned by the Phuket Environmental Foundation as a way to reduce and reuse SW.

The private sector saw the commitment and a political will to solve SW problems as a corner stone to effective SWM. In many meetings with representatives from the private sector such as Royal Phuket City Hotel, Laguna Service Co., Ltd, Pearl Hotel and other civic groups, the importance of ownership and commitment of the of SW problem kept being

repeated. This is displayed in the quote from one of the participants. *“The success of any projects must start from the commitment of the management and the strength of the team.”*

Critiques on the management by the authorities were also present. It is a common view that the problems root from *“the uncertainty of policy by the authority. Although there is waste segregation policy, the authority keeps collecting them together. So people do not see why they should do the separation.”* (Phuket resident)

Under the discussions on waste separation, the topics that were emphasized included having sorting bins, raising knowledge and awareness for the people in the community, having separate trucks for collecting different waste types and promotion of the initiatives through community leaders. However, the challenges of the implementation were identified as the urban nature of the communities where there were many inhabitants who frequently commute which made communication difficult. This raised an interesting idea from one of the NEV-Net representatives that *“the accommodation providers should help promote SW initiatives and make sorting rubbish a rule and disposing rubbish at a specific time. Failure to comply with such rule should incur penalty for both accommodation providers and the inhabitants.”*

From the perspectives of the civil society, waste separation projects of the LAOs are not conducted effectively. Although, there is a call for the government to focus on waste reduction at source, such campaign is often short lived.

The views from the civil society are different from the perspectives of the LAO officials. While the communities are concerned about waste separation, the officials identified the lack of manpower and illegal waste dump as the main problems. It shows the mismatch in the understanding of SW problems and causes. This is reflected in the response of the LAO officials to the public complaint as in the following statement.

“Most people still mix rubbish even when the sorting bins are provided and the LAOs do not have enough budget to hire people and buy collection truck for separate types of waste. The LAOs must focus first on collecting waste from all areas to prevent complaints.”

The above statement exemplifies the widespread perception that the local leaders who come into position by local election usually work on the basis of the political interests rather than management effectiveness.

From the viewpoints of the community, solutions to the SWM problems in Phuket require all sectors to act collectively in the same direction. The policies by the executives in the LAOs must be translated into actions with rigorous enforcement and monitoring to ensure that it is effective. Meanwhile, people in the area must be educated so that they understand why waste must be separated and how to do so in order to make it useful. For the policy to be successful, public administrators must understand people behaviors and educate them about the benefits of waste separation. Nurturing cooperation with the private sector, schools and civil society groups which are interested in this issue is key to successful mitigation of SW problem in practice.

4.4.3 The weaknesses in the implementation of SWM activities from the case study of “Household compost bin”

This section reports the outcomes from the implementation of SWM activities by Phuket CM, ONRE Phuket and Regional Environment Office 15. The case study was selected based on the available SWM project during the time of the study. “Household compost bin” is a bin for organic waste such as vegetables, fruits and food scraps which uses an aerobic composting principle to turn food waste into fertilizer in a household scale (Figure 4.6). It is an initiative by Phuket CM and Phuket Environmental Foundation to reduce organic waste.



Figure 4.6 The household compost bin

The campaign was launched on the 16th September 2014 by distributing the compost bins to residents in Phuket CM area. The researcher and a group of students from Prince of Songkla University Phuket Campus were involved in providing knowledge and organizing a training workshop for the community members who received the bins. The workshop was organized on the 7th of November 2014 and was attended by more than 30 people. The output showed that majority of the participants lack knowledge in reducing organic waste and how to use the compost bins (Appendix II). Figure 4.7 shows the types of questions that were asked during the workshop.

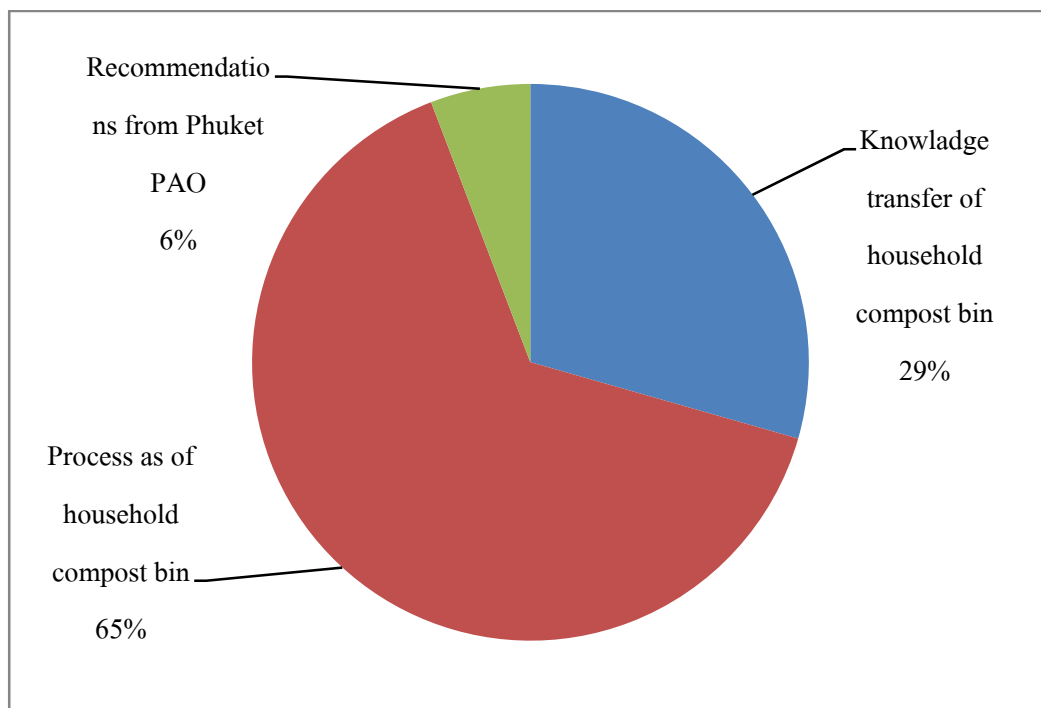


Figure 4.7 The proportion of the types of questions in the household compost bin workshop

The most frequently asked questions included “*where should the bins be located in the house*”, “*how much waste should be put in the bin per day*” and “*what to do if there were maggots?*” This shows that there is a need for providing knowledge to the people before using the compost bins to prevent problems and ineffective usage. The demand for monitoring and staff assistance after the bins distribution was raised by the participants. One participant stated that “*the staff should give the community members knowledge how to make fertilizer from compost so the people understand it better and can make use of it. Some households still do not understand this, like myself.*”

The feedback from the participants highlights that knowledge transfer in the community requires a team of attentive staff who understand the issue and the topic well and can communicate effectively to the members. Failure to provide necessary knowledge about the technology can lead to ineffectiveness and misuse of technology. After the knowledge and

technology has been to given the people, there is also a need to monitor and follow up on the implementation so that problems can be solved and questions are addresses.

This process can also help adjust and improve the implementation of the technology to be appropriate to the context and increase acceptance of changes among the community. It can also increase the ownership and leadership in changes and technology transfer in a sustainable way.

4.4.4 The limitations of implementing SWM Roadmap in 2014

Since the introduction of 2014 Roadmap for SWM, there have been several meetings by the relevant governmental agencies including Board of SWM and wastewater of Phuket Province. The issues of implementing the Roadmap and the way to overcome barriers were discussed and summarized in Table 4.9.

Table 4.9 Analysis of issues and mitigation strategies for implementing SWM Roadmap in 2014.

SWM Roadmap in 2014	Implementation	
	Problems	Resolutions
1. Disposal of old solid waste	<ul style="list-style-type: none"> - 1 tons old SW - Renovation of the old landfill will affect the surrounding communities because of the smell and air pollution 	<ul style="list-style-type: none"> - Hire private sector to operate by dividing the waste into two parts, 50% for the incinerator managed by PJT Technology Co., Ltd company and the other 50% for selling to private sector for making

Table 4.9 Analysis of issues and mitigation strategies for implementing SWM Roadmap in 2014

(cont.)

SWM Roadmap in 2014	Implementation	
	Problems	Resolutions
1. Disposal of old solid waste		energy by the MNRE using the budget in 2015.
2. Create a model of SWM and hazardous waste (new SW) <ul style="list-style-type: none"> - Focus on reducing at source - SWM Center - Waste to energy 	<ul style="list-style-type: none"> - Waste separation projects do not have tangible outcomes due to the lack of budget and human resource - Dangerous waste is mixed with general waste 	<ul style="list-style-type: none"> - Target waste reduction at source especially at retail stores and signing MOU to reduce plastic bag usage, this is to be coordinated by the ONRE Phuket - Promote waste separation and support projects such as biogas production by Phuket PAO and household compost bin - Provide area for storing hazardous waste using the provincial budget of 1.5 million baht to take hazardous waste from all LAOs during specific time each month and send to private companies for disposal every three months - Establish recycling stations

Table 4.9 Analysis of issues and mitigation strategies for implementing SWM Roadmap in 2014

(cont.)

SWM Roadmap in 2014	Implementation	
	Problems	Resolutions
3. To issue rules for waste management and hazardous waste.	Local regulations do not cover waste separations which render the local authority powerless to enforce the waste separation policy.	LAOs must establish local regulations on the management of SW and wastewater.
4. Establish the discipline of the nation towards sustainable management - To educate the public - Law enforcement	Garbage bank or waste separation projects are set up in schools but lack sustainability due to the lack of dedicated human resource and integration into regular curriculum.	- Establish the discipline in young students in educational institutes starting with the schools within the jurisdiction of the Phuket CM - Ask for cooperation from the LAOs to have cleaning days regularly throughout the year especially at the beach or in problematic areas.

The issue that was seen as the most urgent was the disposal of old SW. The meeting of the Board of SWM and wastewater of Phuket Province has identified a co-investment with private sector as a solution. However, this generated criticism that *“the government is letting the private company make profits that should belong to the state.”* Therefore, there was a suggestion to *“repair the old incinerator managed by Phuket CM so that old solid waste can be used to generate energy that can be sold”*. The meeting concluded four

steps for implementing the SWM Roadmap in 2014. Firstly, it focused on addressing the problem of the old and new SW. Secondly, it highlighted the *“need to sort waste from the source and make 19 LAOs the main mechanism for successful operation”*. For the third and fourth steps which deal with hazardous waste and local regulations, details are yet to be discussed.

Despite the importance of implementing the SWM, 19 LAOs were hardly present in the meetings of the Board of SWM and wastewater of Phuket Province in 2014. At the planning meeting for Phuket SWM plan, less than half of the LAOs representatives attended. This shows the weakness in the participation of the local authorities which contribute to the lack of compliance to the policy and cooperation in this SWM issue. Although the governor has stated that *“all LAOs should have experts and personnel in SWM for their areas who actively implement and attend SWM meetings”*, the success was not evident.

4.5 The gaps in Phuket SWM

From the analysis of the findings in the previous sections, the gap in the current SWM in Phuket can be summarized into six issues. Firstly, the LAOs currently focus on collecting waste rather than the waste reduction. Secondly LAOs do not have the same direction or standard for SWM operations. Thirdly, the public administrators in LAOs lack understanding in the SWM laws, the root causes of the SW problem and how to change people behaviors through public education. Fourth, the SWM policies and operations are currently based on political interests and influenced by politicians. Fifth, people in the communities lack awareness and knowledge about the significance and method of waste separation. Finally, the synergy in SWM from collaboration with private sector, schools and civil society groups is not yet optimized due

to the lack of support for knowledge transfer and networking agent. This provides the resolutions for research question 3.

This chapter concludes that the research questions 1 to 3 have been resolved by describing the current SWM system in Phuket, the roles of the civil society, and the gaps in Phuket SWM.

CHAPTER 5

SYNTHESIS

This chapter uses the findings from the previous chapters to analyze, the factors and strategies that can increase SWM effectiveness. Research questions 4 and 5 are addressed in this chapter.

5.1 The factors that can increase SWM effectiveness in Phuket

The findings highlight the need to focus on the following factors to improve the effectiveness of SWM in Phuket. This section provides a resolution for research question 4.

5.1.1 Leadership

The lack of environmental leadership in LAOs and volunteers contribute to failures to solve SWM problems at root causes. This is reflected in the poor responses and attendance from the LAOs to the SWM meetings. At activity level, weak leadership in the area can result in to conflicts and negative attitudes within the community members. For example, the beach cleaning programs initiated by the organizations from outside the areas can offend the local volunteers and operators if they are not included into these activities.

5.1.2 Ownership

The lack of ownership among the LAOs and people in the community for the responsibility to help solve SW problems greatly hinders the effectiveness of SWM. This is the case when the authorities and individuals perceive that the duty to address the issues belong to others but not themselves and rely on someone else to take actions. This is evident through an LAOs's response to a resident complaint. On the LAOs web board, a resident reported that *"the municipality fails to collect the garbage, the bins are not distributed sufficiently and there are overflowing"*. Meanwhile, the LAOs staff stated in the interview that *"when bins are given for free, people do not take care of them, some stole the bins to use for themselves and the people do not help keep the area clean."* Increasing the ownership of SWM responsibilities in the stakeholders in the area can help reduce ignorance and negligence of SW problems and increase cooperation for problem solving.

5.1.3 Teamwork

Poor teamwork and weak collaboration between organizations often result in the overlapping but ineffective SWM projects. An initiative such as waste sorting in the community is conducted by many organizations such as the provincial environmental office and the LAOs. However, there is no common direction or framework to ensure a standard of operation and continuity. The quality of the outcomes depends on the individuals in the project. In addition, these projects can compete for volunteers and participants among themselves. Therefore, the strengths and quality of a team or a working group for SWM can greatly enhance the SWM effectiveness.

5.1.4 Awareness and environmental education

The awareness and environmental education of the LAOs and the public need to be improved in order to increase SWM effectiveness. Several LAO officers perceived the issue of waste as secondary to other problems. From the interviews, many claimed multiple responsibilities and work overload as the reason for the failure to perform their duties and solve SWM problems. Meanwhile many community members also contribute to the problem by littering. This is reflected by the statement of an individual in a community that *“keeping the area clean is the duty of a rubbish worker, I see no reason for doing this especially when I paid the rubbish fee already”*. Such attitude needs to be changed and awareness raised to educate the public that SWM is the duty of everyone. This also relates to the sense of ownership in the community which is critical in promoting better environmental behaviors.

5.1.5 Sustainability

Most initiatives for SWM at local level do not sustain in a long term. Part of the reasons is the absence of a champion or a leadership team to continue the activities after an initial launch or the funding period. The support for the activities highly depends on whether they have been included in the development plan of the LAOs or not. For example, “Garbage Bank” project was initiated by the LAOs in several schools. However, the project stopped because either there was no responsible staff to continue the implementation or bad management has made the project unsuccessful. Often, the feedback about the activities and the problems were not reported back to the funding organizations which made them unaware of the causes for the cessation of the activities. Therefore, an effort to enable SWM activities to sustain in a long term will greatly increase their effectiveness.

5.2 The strategies to increase the capacity for waste reduction

From the analysis of the findings on weaknesses and opportunities in the current SWM in Phuket, the recommendations for improving the capacity for waste reduction are presented in this section. It provides the answers for the research question 5.

5.2.1 Legislation and policy

1) All relevant LAO officers should be required to participate in the SWM meetings and implement the policies issued by the Board of SWM and wastewater of Phuket Province.

2) The Board of SWM and wastewater of Phuket Province needs to have the power to regulate the SWM practices of the LAOs.

3) All LAOs should ensure that their local regulations on SW transport and disposal comply with a national environmental standard.

4) All LAOs should create an action plan and a master plan for SWM.

5) All LAOs should be required to assign a staff with an appropriate expertise to be in charge of SWM in the area.

5.2.2 Participation promotion

1) All LAOs should establish a local working group for SWM activities which include representatives from all sectors.

2) Representatives from all sectors should be included in the planning and evaluation of SWM strategies.

3) There should be a common channel for reporting SW problems in all areas.

4) There should be a mechanism to encourage all sectors to initiate and participate in the SWM activities in their areas.

5) The SWM master plan and action plan should be created by all LAOs through a public participation process in each area.

5.2.3 Environmental program promotion and integration

1) The schools under the jurisdiction of the LAOs should include an environmental education in their curriculum.

2) The Board of SWM and wastewater of Phuket Province can coordinate an environmental education program to be offered in local schools.

3) The LAOs should provide a support for the creation of a youth environmental group or club both within and outside the schools.

4) Include an environmental education into an existing curriculum such as boy scouts and girl scouts.

5) Put an emphasis on SWM and waste reduction knowledge in the schools and public education activities.

6) Establish a monitoring and evaluation scheme for the environmental education activities.

7) Provide an environmental education program for all occupations and age groups through both formal and informal education programs.

5.2.4. Evaluation and monitoring

1) Board of SWM and wastewater of Phuket Province should establish a working group to evaluate and monitor the implementation of the LAOs and their subsidiary institutes such as schools.

2) Promote the participation of local volunteers and civil society groups in the evaluation and monitoring of the LAO SWM activities.

3) The Regional Environmental Office 15 Phuket or a relevant authority should provide a standard for evaluation of an SWM operation.

4) Establish a mechanism for exchanging knowledge and feedback between the LAOs and volunteers or community members so that problems are reported and solved on a regular basis.

5) Establish an expert working group at provincial level to provide a consultation to the LAOs and SWM stakeholders.

To improve SWM effectively, the strategies need to address all parts of the SWM system. The recommendations can be mapped to the components of SWM which are divided into waste generation (source), transport and disposal (Table 5.1).

Table 5.1 The strategies to increase the capacity for SWM in Phuket

Strategies	Source	Transport	Disposal
Legislation and policy			
1) All relevant LAO officers should be required to participate in the SWM meetings and implement the policies issued by the Board of SWM and wastewater of Phuket Province.	/	/	/
2) The Board of SWM and wastewater of Phuket Province needs to have the power to regulate the SWM practices of the LAOs.	/	/	

Table 5.1 The strategies to increase the capacity for SWM in Phuket (cont.)

Strategies	Source	Transport	Disposal
Legislation and policy			
3) All LAOs should ensure that their local regulations on SW transport and disposal comply with a national environmental standard.	/	/	/
4) All LAOs should create an action plan and a master plan for SWM.	/	/	/
5) All LAOs should be required to assign a staff with an appropriate expertise to be in charge of SWM in the area.	/	/	/
Participation promotion			
1) All LAOs should establish a local working group for SWM activities which include representatives from all sectors.	/	/	/
2) Representatives from all sectors should be included in the planning and evaluation of SWM strategies.	/	/	/
3) There should be a common channel for reporting SW problems in all areas.	/	/	/
4) There should be a mechanism to encourage all sectors to initiate and participate in the SWM activities in their areas.	/	/	/
5) The SWM master plan and action plan should be created by all LAOs through a public participation process in each area.	/	/	/

Table 5.1 The strategies to increase the capacity for SWM in Phuket (cont.)

Strategies	Source	Transport	Disposal
Environmental program promotion and integration			
1) The schools under the jurisdiction of the LAOs should include an environmental education in their curriculum.	/	/	/
2) The Board of SWM and wastewater of Phuket Province can coordinate an environmental education program to be offered in local schools.	/	/	/
3) The LAOs should provide a support for the creation of a youth environmental group or club both within and outside the schools.	/	/	/
4) Include an environmental education into an existing curriculum such as boy scouts and girl scouts.	/	/	/
5) Put an emphasis on SWM and waste reduction knowledge in the schools and public education activities.	/	/	/
6) Establish a monitoring and evaluation scheme for the environmental education activities.	/	/	/
7) Provide an environmental education program for all occupations and age groups through both formal and informal education programs.	/	/	/

Table 5.1 The strategies to increase the capacity for SWM in Phuket (cont.)

Strategies	Source	Transport	Disposal
Evaluating and monitoring			
1) The Board of SWM and wastewater of Phuket Province should establish a working group to evaluate and monitor the implementation of the LAOs and their subsidiary institutes such as schools.	/	/	/
2) Promote the participation of local volunteers and civil society groups in the evaluation and monitoring of the LAO SWM activities.	/	/	/
3) The Regional Environmental Office 15 Phuket or a relevant authority should provide a standard for evaluation of an SWM operation.	/	/	/
4) Establish a mechanism for exchanging knowledge and feedback between the LAOs and volunteers or community members so that problems are reported and solved on a regular basis.	/	/	/
5) Establish an expert working group at provincial level to provide a consultation to the LAOs and SWM stakeholders.	/	/	/

The strategies to increase the SWM capacities of the LAOs need to address the issues of waste production at source, transport and disposal because these are the important processes of SWM. The implementation of these strategies in each LAO may differ depending on the contexts and the available resources in the area. In some areas, a physical intervention such as an establishment of a sanitary landfill might be possible if guided by a careful impact analysis, integrated knowledge, community consultation and an appropriate technology.

This chapter has provided the resolutions for research questions 4 and 5 and the suggestions for improving the SWM system in Phuket.

CHAPTER 6

CONCLUSION

This chapter concludes with the summary of the answers for research questions 1 to 5. The findings from previous chapters have described the current SWM system, the participation of the civil society, the weaknesses of SWM system, the factors that can increase waste reduction at source and the strategies to increase capacity for waste reduction.

This study analyzed the SWM system in Phuket which was often referred as a “centralized approach”. However, such perception was found to influence the widespread misconception of SWM as a disposal rather than the system of waste generation, transport and disposal. The investigation in this research revealed that the 19 LAOs in Phuket, despite signing the MOUs to send waste to the incinerator in Phuket CM, adopted various approaches to collect and transport their local SW. There are three main approaches, self-management, partial outsource and complete outsource. Although the SWM in Phuket is supervised by the Board of SW and wastewater at Provincial level, its ability to implement the policies and recruit cooperation has been limited due to the lack of power to provide incentives for compliance and impose penalties for non-compliance. Nevertheless, the change in the governance at the national level has brought a great change to the SWM at provincial level. The introduction of SWM Roadmap in 2014 has put pressure on the local authorities in many provinces including Phuket. This highlights the role of governance in the effectiveness of SWM.

Although Phuket has been considered a learning center for SWM by other provinces, there are still many challenges to be overcome. The weaknesses in the regulations and enforcement result in the varying standard of SWM practices at the operation level. Although

there are many SWM volunteer groups, the majority of the people in the communities is not aware of their roles and responsibilities in SWM and often exacerbates the problems or obstructs the solutions. This can be seen as a result of the lack of ownership and leadership in the communities. Building environmental leadership in all levels and sectors is the key for improving an environmental awareness and increasing the public participation in SWM. As for LAOs, the short-term visions and limited knowledge often cause the failures to address the problems, monitor the results and evaluate the impacts of the SWM projects. Consequently, the SWM initiatives are not implemented effectively or sustainably. Change in the attitudes and perceptions about the SWM issues in the community stakeholders are crucial in mitigating the problems in Phuket.

For future study, it is suggested that further research can be conducted in the following topics.

- 1) Monitoring and evaluating the impacts as a result of implementing SWM Roadmap in 2014, the master plan and the action plan.
- 2) Study the public response towards the change in SWM.
- 3) Analyze the causes of SWM issues of each LAO.
- 4) Consolidate the outcomes and lessons from SWM learning centers that have been initiated in Phuket.

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APPENDICES

Appendix I
Interviews with 19 LAOs in Phuket



**แนวสัณภาษณ์เชิงลึกสำหรับผู้บริหารและผู้ปฏิบัติงานขององค์กรปกครองส่วนท้องถิ่น
การศึกษาเรื่อง การประเมินศักยภาพการกำจัดขยะที่แหล่งกำเนิดของท้องถิ่น
กรณีศึกษา จังหวัดภูเก็ต**

คำชี้แจง แบบสัมภาษณ์เชิงลึกนี้จัดทำขึ้นเพื่อเก็บรวบรวมข้อมูล และใช้ประกอบการศึกษาของ นักศึกษาปริญญาโท หลักสูตรเทคโนโลยีและสิ่งแวดล้อม สาขาเทคโนโลยีและการจัดการ สิ่งแวดล้อม และขอรับรองว่าข้อมูลที่ได้จากการสัมภาษณ์นี้ เพื่อสรุปเป็นภาพรวมทางการศึกษา เท่านั้น ดังนั้นจึงใคร่ขอความร่วมมือในการตอบแบบสัมภาษณ์เชิงลึกชุดนี้

ผู้ศึกษาขอขอบคุณท่าน ที่ให้ความอนุเคราะห์ในการตอบแบบสัมภาษณ์เชิงลึกเป็นอย่างยิ่ง
มา ณ ที่นี้

1. ประเด็นนโยบาย

- 1.1 ท้องถิ่นมีนโยบายการจัดการขยะมูลฝอยภาพรวมเป็นอย่างไร มุ่งเน้นไปในทิศทางใด
- 1.2 ฝ่ายบริหารขององค์กรมีความมุ่งมั่นในการดำเนินตามนโยบายการจัดการขยะมูลฝอยอย่างไร
- 1.3 ความต่อเนื่องของนโยบาย เมื่อมีเปลี่ยนแปลงผู้นำมีผลกระทบต่อจัดการขยะหรือไม่ อย่างไร
- 1.4 หน่วยงานใดที่รับผิดชอบในการจัดขยะมูลฝอยในท้องถิ่น และขึ้นตรงกับภาคส่วนใด
- 1.5 จากนโยบายเหล่านี้มีโครงการใดบ้างที่เกิดขึ้นแล้วหรือกำลังจะเกิดขึ้นในอนาคต เป็นโครงการที่กระทำกับหน่วยงานใด และผลตอบรับเป็นไปในทิศทางใด
- 1.6 นโยบายการจัดการขยะสำหรับสถานประกอบการต่างๆมีความพิเศษ ไร่บ้าง

2. ประเด็นพื้นที่รับผิดชอบ

- 2.1 บริบทพื้นที่ของท้องถิ่นมีลักษณะเป็นอย่างไร ส่วนใดยังคงเป็นปัญหาในการจัดการ
ขยะ
- 2.2 มีปัญหาการซ้อนทับของพื้นที่รับผิดชอบหรือไม่ หากมีเกิดขึ้นกับท้องถิ่นใดและมีการ
แก้ไขอย่างไร
3. ประเด็นขยะมูลฝอย และการคัดแยกของชุมชน
 - 3.1 แหล่งกำเนิดขยะมาจากแหล่งใดบ้าง เยอะที่สุดที่ใด
 - 3.2 จำนวนถังขยะเพียงพอหรือไม่
 - 3.3 องค์ประกอบของขยะเป็นอย่างไร มีการตรวจวัดองค์ประกอบอย่างไร
 - 3.4 ขั้นตอนการจัดการโดยภาพรวมเป็นอย่างไร
 - 3.5 ท้องถิ่นมีโครงการหรือการรณรงค์ เรื่องการคัดแยกขยะชุมชนอย่างต่อเนื่องหรือไม่ มี
ความถี่เท่าไร ผลจากที่ทำกิจกรรม มีผลอย่างไร
 - 3.6 ผลตอบรับเรื่องการคัดแยกขยะของชุมชนเป็นอย่างไร
 - 3.7 มีการขึ้นทะเบียนร้านรับซื้อของเก่าหรือไม่
4. ประเด็นการจัดเก็บขยะมูลฝอย
 - 4.1 ท้องถิ่นมีรถเก็บขนกี่คัน ภาครัฐกี่คัน เอกชนกี่คัน
 - 4.2 เก็บเวลาใด สถานที่ใด
 - 4.3 มีการคัดแยกขยะระหว่างการเก็บหรือไม่
5. ประเด็นการขนส่ง
 - 5.1 มีจุดพักขยะก่อนส่ง ต่อเข้าสู่เตาเผาขยะชุมชนหรือไม่ หากมีอยู่ที่ไหน รองรับได้
เท่าไร มีบทบาทหน้าที่อะไรบ้าง
 - 5.2 รถในการขนเป็นแบบใด ขนาดเท่าไร สีอะไร
 - 5.3 มีระบบการดูแล การจัดการด้านการขนส่งอย่างไร
6. ประเด็นค่าใช้จ่าย
 - 6.1 ค่าธรรมเนียมในการจัดเก็บ คร่าวเรือน สถานประกอบการ มีอัตราเท่าใด
 - 6.2 ค่าใช้จ่ายในการจัดการขยะ ค่าเชื้อเพลิง ค่าจ้างพนักงาน ค่ากำจัด

6.3 อัตราค่าธรรมเนียมอ้างอิงจากหน่วยงานใด

7. ประเด็นการมีส่วนร่วมขององค์กรต่างๆในท้องถิ่น

7.1 การมีส่วนร่วมของชุมชนในการทำกิจกรรมต่างๆ

7.2 ท้องถิ่นมีองค์กรภาครัฐ ภาคเอกชน หรือภาคประชาชน อะไรบ้าง มีความร่วมมือกัน
ในการดำเนินกิจกรรมอย่างไร

8. ประเด็นปัญหาและอุปสรรคในการจัดการขยะมูลฝอยของท้องถิ่น

8.1 ปัญหาและอุปสรรคภาพรวมของท้องถิ่นเป็นอย่างไร

8.2 มีแนวทางการแก้ไขหรือไม่ อย่างไร

9. ประเด็นการจ้างเอกชน

9.1 ท้องถิ่นมีนโยบายในการจัดจ้างเอกชนมาช่วยในการจัดการขยะมูลฝอยหรือไม่ ถ้ามี
ระยะเวลาในการจ้างเท่าใด จ้างบริษัทใดบ้างในราคาค่าจ้างเท่าไร

9.2 เอกชนรับผิดชอบส่วนใด พื้นที่ใดบ้าง

9.3 มีปัญหาการซ้อนทับกับภาครัฐ หรือท้องถิ่นอื่นหรือไม่

9.4 รถเอกชนมีการคัดแยกขยะหรือไม่ มีการนำไปจุดพักก่อนหรือไม่

9.5 รถเอกชนนำขยะไปทิ้งที่ไหน

Table A 1.1 General information of 19 LAOs in Phuket

No.	Organizations	Area (sq. km)	Population	Population density persons / sq km	The volume of SW 18/09 / 2013-15 / 09/2557	Rates of waste per day	SWM Outsource (%)
Phuket Mueang District							
1	Phuket CM	12	75,536	6294.7	46,803	128	50
2	Phuket PAO		-		3,067	8	0
3	Wichit SM	56	43,922	784.32	15,036	41	50
4	Ratsada SM	38	43,874	1154.6	14,144	39	0
5	Chalong SM	25	21,586	863.44	21,531	59	0
6	Rawai SM	38	16,372	430.84	21,862	60	0
7	Karon SM	20	7,960	398	2,838	8	0
8	Ko Kaeo SAO	48	6,539	136.23	9,598	26	100
Thalang District							
9	Choeng Thale SM	5.2	6,388	1228.5	4,219	12	50
10	Thep Krasatti SM	4	7,012	1753	4,325	12	0
11	Pa Khlok SM	38	14,215	374.08	2,698	7	50
12	Si Sunthon SM	32.9	19,131	581.49	11,626	32	0
13	Choeng Thale SAO	37.1	10,984	296.06	12,795	35	50
14	Thep Krasatti SAO	78.4	13,218	168.6	701	2	0
15	Sakhu SAO	19.7	5,758	292.28	0	0	100
16	Mai Khao SAO	29.2	12,574	430.62	5,362	15	0
Kathu District							
17	Patong TM	16.4	19,725	1202.7	43,145	118	50
18	Kathu TM	34.81	24,568	705.77	2,825	8	50
19	Kamala SAO	18.9	6,468	342.22	3,251	9	0

Table A 1.2 Interviews data from 19 LAOs: Policy and Collection

No.	Organizations	Policy								Collection					
		Waste collection fee	Bins distribution	Corruption and politics	Organization structure	Discontinuation of policy for SW projects	SW separation project	Personnel issue (Administration and cleaning staff)	Waste collection schedule	Residual solid waste	Transit time to the incinerator	Not enough trucks, old trucks, damaged trucks	Large area	Position of the bins	Separate collection of organic waste
Mueang Phuket District															
1	Phuket CM		1				1		1					1	1
2	Phuket PAO					1		1				1			
3	Wichit SM							1				1	1		
4	Ratsada SM							1							
5	Chalong SM							1		1		1	1		
6	Rawai SM							1			1	1			
7	Karon SM					1		1	1						
8	Ko Kaeo SAO			1	1			1							

Table A 1.2 Interviews data from 19 LAOs: Policy and Collection (cont.)

No.	Organizations	Policy							Collection						
		Waste collection fee	Bins distribution	Corruption and politics	Organization structure	Discontinuation of policy for SW projects	SW separation project	Personnel issue (Administration and cleaning staff)	Waste collection schedule	Residual solid waste	Transit time to the incinerator	Not enough trucks, old trucks, damaged trucks	Large area	Position of the bins	Separate collection of organic waste
	Thalang District														
9	Choeng Thale SM							1							
10	Thep Krasatti SM					1		1			1				
11	Pa Khlok SM					1									
12	Si Sunthon SM		1	1				1							
13	Choeng Thale SAO							1							
14	Thep Krasatti SAO					1		1			1				
15	Sakhu SAO														
16	Mai Khao SAO							1		1	1	1			

Table A 1.2 Interviews data from 19 LAOs: Policy and Collection (cont.)

No.	Organizations	Policy							Collection						
		Waste collection fee	Bins distribution	Corruption and politics	Organization structure	Discontinuation of policy for SW projects	SW separation project	Personnel issue (Administration and cleaning staff)	Waste collection schedule	Residual solid waste	Transit time to the incinerator	Not enough trucks, old trucks, damaged trucks	Large area	Position of the bins	Separate collection of organic waste
	Kathu District														
17	Patong TM						1		1		1			1	
18	Kathu TM														
19	Kamala SAO	1						1							

Table A 1.3Interviews data from 19 LAOs: Characteristics, Population and Others

No.	Organizations	SW Characteristics						Population				Other			Participation in SW segregation	Remark
		Illegal dumping	Fishing debris and foams	Construction waste and large items	Agricultural waste and shrimp farms	Waste from boats	Infectious waste	Waste from the sea	Bias against collection staff	Increasing population and the housing estates	Lack of volunteers	Urban lifestyles	Construction camps	Strength Hotels Association		
Mueang Phuket District																
1	Phuket CM										1					Focused on technology
2	Phuket PAO					1										Areas: Phuket PAO staff house and Chalong port.
3	Wichit SM	1						1	1							
4	Ratsada SM	1	1			1		1	1							
5	Chalong SM	1		1				1								
6	Rawai SM	1				1										
7	Karon SM															
8	Ko Kaeo SAO							1								

Table A 1.3 Interviews data from 19 LAOs: Characteristics, Population and Others (cont.)

No.	Organizations	SW Characteristics						Population				Other			Participation in SW segregation	Remark
		Illegal dumping	Fishing debris and foams	Construction waste and large items	Agricultural waste and shrimp farms	Waste from boats	Infectious waste	Waste from the sea	Bias against collection staff	Increasing population and the housing estates	Lack of volunteers	Urban lifestyles	Construction camps	Strength Hotels Association		
Thalang District																
9	Choeng Thale SM															
10	Thep Krasatti SM	1														
11	Pa Khlok SM	1			1		1									
12	Si Sunthon SM	1						1			1					
13	Choeng Thale SAO	1														

Table A 1.3 Interviews data from 19 LAOs: Characteristics, Population and Others (cont.)

No.	Organizations	SW Characteristics						Population				Other			Participation in SW segregation	Remark
		Illegal dumping	Fishing debris and foams	Construction waste and large items	Agricultural waste and shrimp farms	Waste from boats	Infectious waste	Waste from the sea	Bias against collection staff	Increasing population and the housing estates	Lack of volunteers	Urban lifestyles	Construction camps	Strength Hotels Association		
Thalang District																
14	Thep Krasatti SAO	1			1				1							
15	Sakhu SAO														Naithon Green Club	Disposal in Khokkloi landfill, Phang Nga Province and borrowed collection trucks from Mai Khao SAO.
16	Mai Khao SAO				1							1				

Table A 1.3 Interviews data from 19 LAOs: Characteristics, Population and Others (cont.)

No.	Organizations	SW Characteristics							Population				Other			Participation in SW segregation	Remark
		Illegal dumping	Fishing debris and foams	Construction waste and large items	Agricultural waste and shrimp farms	Waste from boats	Infectious waste	Waste from the sea	Bias against collection staff	Increasing population and the housing estates	Lack of volunteers	Urban lifestyles	Construction camps	Strength Hotels Association	Hotel have good SWM		
	Kathu District																
17	Patong TM	1		1			1	1		1	1	1		1	1		Focused on awareness
18	Kathu TM	1											1				
19	Kamala SAO								1							Kamala Green Club	Illegal dumping not mentioned which contradicted to the information in reality.

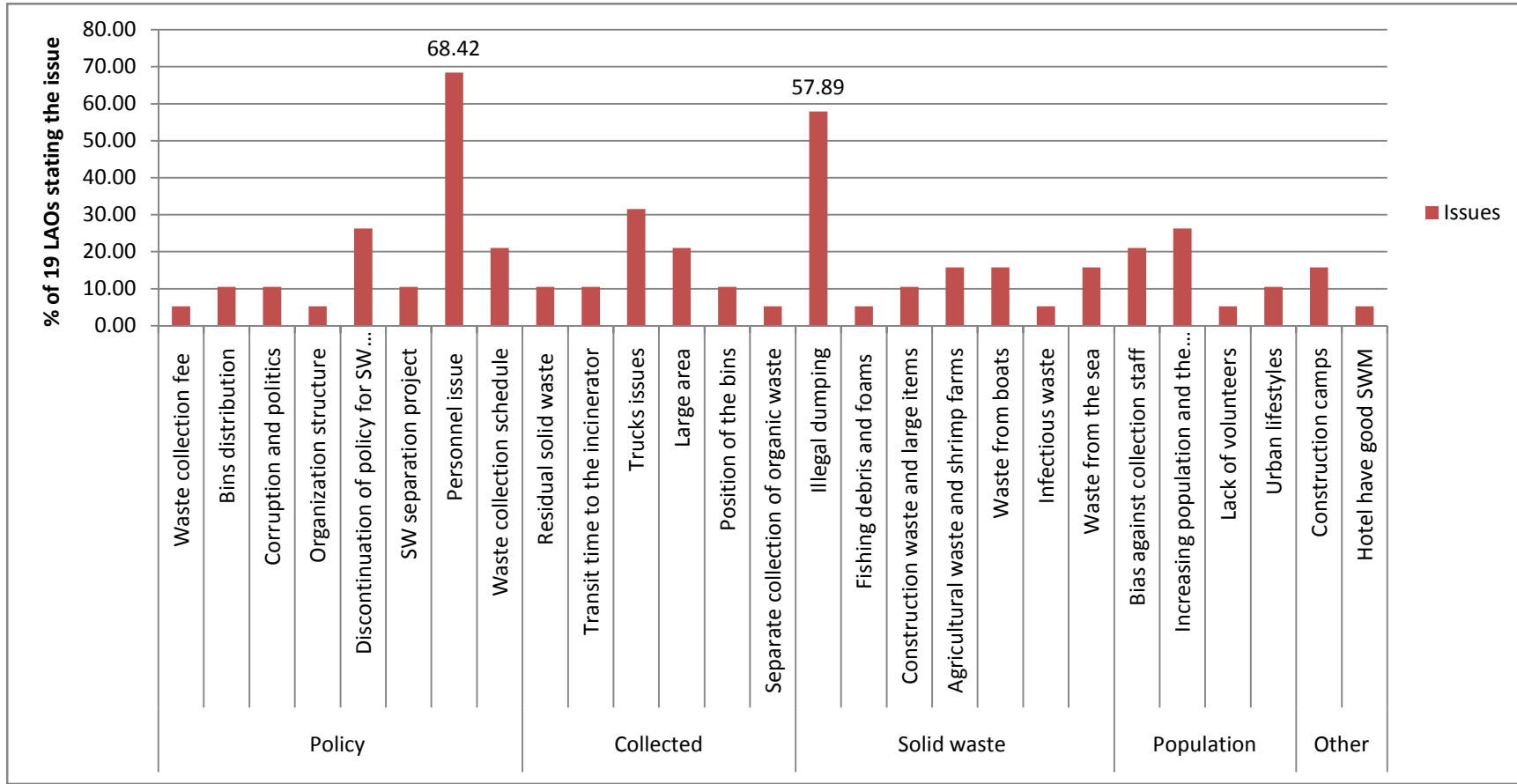


Figure A1.1 The issues stated by 19 LAOs

Appendix II

Household compost bin workshop

Table A 2.1 Demographic of the household compost bin workshop

Before (n=30)						
Gender	Male = 9			Female = 21		
Age	Not identified = 2	< 30 = 2	31-40 = 2	41-50 = 5	> 50 = 19	
After (n=31)						
Gender	Male = 10			Female = 21		
Age	Not identified = 2	< 30 = 1	31-40 = 3	41-50 = 6	> 50 = 19	

Table A 2.2 The understanding in the amount of food waste that occurs in the community
(5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	8	15	5	2	-	-
After(n=31)	10	12	8	1	-	-

Table A 2.3 The understanding in the amount of dry leaves, dry grass that occurs in the community (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	6	12	7	4	-	1
After (n=31)	8	7	12	3	-	1

Table A 2.4 The agreement with the notion that the community has the right place to put the bins
(5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	5	11	11	1	2	-
After (n=31)	7	6	11	4	2	1

Table A 2.5 The level of knowledge and understanding of the organic waste in the households
(5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	2	9	14	5	-	-
After (n=31)	8	14	6	-	-	3

Table A 2.6 The understanding in the process to use a household compost bin (5 = Most,
1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	2	6	17	4	-	1
After (n=31)	11	16	4	-	-	-

Table A 2.7 The ability to integrate knowledge from the training into practice for the use of a household compost bin (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	4	9	10	5	2	-
After (n=31)	10	15	5	-	-	1

Table A 2.8 The likelihood of the product from a household compost bin being utilized (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	6	10	10	1	2	1
After (n=31)	13	13	3	1	-	1

Table A 2.10 The understanding of waste separation in the community (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	5	10	10	1	1	3
After (n=31)	11	14	3	1	1	1

Table A 2.11 The level of the public relations and promotion of a household compost bin in the community (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	-	10	12	4	4	-
After (n=31)	3	16	10	1	-	1

Table A 2.12 The level of participation of the community in the use of a household compost bin (5 = Most, 1 = Least)

Time of survey	Scores					
	5	4	3	2	1	N/A
Before (n=30)	-	6	14	6	4	-
After (n=31)	4	10	11	3	2	1