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Efficiency of Waste Management in Phuket Province

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ABSTRACT

This research investigates the efficiency of waste management in Phuket. Qualitative research was conducted to the government agencies and quantitative research to a study group of 400 heads of households in Phuket. The research findings show that both the government and the people feel that there is still a low level of waste processing and waste transportation. The findings that were inconsistent between the public and private sectors include different ideas about waste disposal, technology utilization, people's participation in the decision making and evaluation. There are clear indicators that the government needs to establish better correlations with the people to create a more efficient waste management system.

Key words: Waste management, waste disposal behavior, technology utilization, people's participation

INTRODUCTION

A crucial crisis the world's natural resources and environment are facing is the rapid growth of world population. Annually the populations of developed countries grow an average 0.1% while those of developing countries reach a high average of 1.5% (www.ertc.deqp.go.th/ertc). The United Nations projects that by 2025 the world population will have increased to 7.9 billion (www.mythland.org/v3/thread-3646-1-1.html). The growing world population combined with new developments in science and technologies used in manufacturing processes have substantially increased the amount of waste that pollutes our natural environment and resources (Sivakumar and Sugirtharan, 2010; Ziadat and Mott, 2005).

In 2005 Thailand's waste generation was 14.3 million tons per annum. In 2010 it increased to approximately 15.2 million tons per annum, 6% of which was waste generated in Bangkok municipality, urban municipalities nationwide and rural sub-districts nationwide (Pollution Control Department, Ministry of Natural Resources and Environment, www.pcd.go.th/info/_/waste_wastethai48_53.htm1.) The Thai government has formulated policies and regulations to address the issue but has not been able to bring waste management under control (Sujauddin *et al.*, 2008). There remain large amounts of undisposed waste, particularly in major cities and tourism destinations such as Bangkok and Phuket, whose rapid growth lead to increased volume of waste and subsequent waste management issues.

As the level of waste pollution increases, research on waste management has grown. Tchobanoglous *et al.* (1993) divided waste management into four primary steps: Storage, transportation, processing and disposal. Maity *et al.* (2011) and Phillips *et al.* (1999) studied waste

disposal behavior implementing the 3Rs: Reduce, Reuse and Recycle while Ayotamuno and Gobo (2004) and Ngowi (1997) categorized people's participation in waste management into four steps: Decision making, implementation, benefits and evaluation. McDonald and Smithers (1998) studied technology utilization in landfills, incineration and composting. This research aims to study the performance and opinion of the people in Phuket upon the government sector's waste management.

METHODOLOGY

This research is a combination of quantitative and qualitative studies. In the quantitative study a questionnaire was used to collect data from heads of households. This questionnaire was first assessed to get the Item Objective Congruence (IOC) value to identify the question with the IOC value greater than 0.60. Then the reliability of the selected questions was measured with Cronbach's Alpha Coefficient.

The main survey was conducted with a group of 400 participating heads of households in Phuket. Participants in the study group were chosen by stratified random sampling into three districts of Phuket Province then by simple random sampling. According to Stevens (1986) the size of the sample group is fitting for the analysis by LISREL.

An analysis using a Structural Equation Model (SEM) was also conducted on four factors namely, (1) Waste management, (2) Waste disposal behavior, (3) Technology utilization in waste management and (4) People's participation. The level of these factors was shown with the statistical analysis for percentage, mean and standard deviation.

The qualitative study utilized an in-depth interview to the key-informants in the administrative positions of the environmental offices of Phuket Municipality and the non-governmental organization. The content analysis was used to study the data (Bryman and Burgess, 1994) holistically and interpret them systematically.

WASTE MANAGEMENT BY GOVERNMENT

Qualitative research was conducted by analyzing data collected through observation and in-depth interviews the Director of the Regional Environment Office 15 Phuket, the executive committee of Phuket City Municipality and the president of Phuket Environment Protection Forum regarding, (1) Waste management, (2) Waste disposal behavior, (3) Technology utilization in waste management and (4) People's participation.

RESULTS

Waste management: Phuket waste management system is centralized and overseen by the Phuket Waste Management Committee led by the Phuket governor. The committee has chiefs of the local administrative organizations serving as directors and the chief of Phuket Provincial Office of natural resources and environment as secretary, overseeing waste management policies and the implementation of said policies as well as delegating waste collection, transportation, processing and disposal responsibilities to relevant departments.

Waste collection is a responsibility carried out by all 19 local administrative organizations through private contractors hired to collect waste from households, communities and businesses in the area. Phuket Province divides waste into four categories which are bio-degradable waste, sellable waste, general waste and hazardous waste. However, it has been found that the population has not followed these categories in their waste disposal habits, inhibiting effective waste disposal categorization.

Waste transportation is also a responsibility of all the local administrative organizations that has been contracted out to private companies. Collected waste is to be transported to Phuket City Municipality's central waste disposal facility, yet various problems have been encountered including a lack of garbage trucks with proper waste separating facilities, lack of funding to fix dilapidated garbage trucks that leak odorous waste fluids onto the roads or to buy new garbage trucks, as well as time constraints on each waste collection route.

While it is normally the government's role to educate the population and establish a waste processing facility in the community, waste processing in Phuket Province is still only in the beginning stages due to the fact that Phuket's economy is not conducive to the building of waste processing facilities. Currently only bio-degradable waste is being processed into ink or compost but at a very low level.

Phuket City Municipality is responsible for waste disposal. Its central waste disposal facility disposes of waste by 120 rai of landfill which has already reached full capacity; a 250-ton incinerator which is currently out of service; a 700-ton incinerator; an incinerator for medical waste from hospitals and a dump for other hazardous waste.

Waste disposal behavior: Waste disposal behavior comprises reducing, reusing and recycling. A lack of cooperation between the local government and the people has discouraged high levels of effective waste disposal behavior. The lack of co-ordination between various government organizations and low levels of awareness about proper waste disposal behavior among the people all contribute to this fact.

In Phuket waste reduction is encouraged through a campaign promoting the use of environmentally-friendly packaging. However, there are very few signboards or posters around Phuket promoting this campaign. Campaign activities tend to be simply an official campaign launch ceremony and the signing of various MOUs more than continuous implementation of the campaign strategies. This leads to a broken, disorganized waste management system that cannot be accurately evaluated which also means an inefficient waste management system caused by a lack of government interest.

The local government has encouraged reusing yet has not provided guidelines or examples that would describe how exactly reusing should be done effectively to yield lasting results. As for recycling, since Phuket does not have a recycling plant, the only recycling done is that through businesses buying old furniture and appliances that process the goods and sell them elsewhere.

Technology utilization in waste management: Technology utilization consists of landfills, incineration and composting.

Phuket has a 120-rai landfill which has already reached its full capacity and cannot be expanded. The only way forward is to dig up the old landfill and convert it to a plasma gasification landfill.

The incinerators in Phuket are currently managed by private companies working under the supervision of Phuket City Municipality to ensure the operation of the incinerators follow legal ordinances. While using incinerators is an acceptable method of technology utilization in waste management, it is not recommended that the size of Phuket's existing incinerators increase in direct correlation with the amount of generated waste. Instead, reducing the amount of waste, categorizing waste for efficient waste disposal and reusing waste as possible should be more encouraged.

Due to the fact that Phuket's economy is sustained less by agriculture than by tourism and related business, composting has not received much interest from the community.

People's participation: People's participation in waste management can be divided into four steps: Decision making, implementation, benefits and evaluation. People's participation in decision making starts from planning to overseeing private contractors to budgeting for waste management. Participation in implementation is involvement in the waste management practices under the responsibility of relevant government organizations. Sharing in the benefits an effective waste management system would have on the development of Phuket, improved tourism and better health of the population would constitute people's participation in benefits while people's participation in evaluation would include involvement in the monitoring of the entire waste management process through legal and local government ordinances as well as through unofficial channels such as community volunteers.

WASTE MANAGEMENT BY PEOPLE

Quantitative research was conducted by analyzing data collected from a study group of 400 heads of households in Phuket. Participants in the study group were chosen by stratified random sampling into three districts of Phuket Province then by simple random sampling.

Waste management is an important service the government must provide to the people from collection, transportation, processing and disposal.

Research findings show that the people feel that government organizations have performed at a high level in waste collection. Waste processing was seen to be performed at a second highest level as there are still few waste processing facilities in Phuket. Technology utilization in waste management such as landfills, incineration and composting had the third highest level of performance as there is still little awareness or understanding of these technologies among the people. Waste transportation was seen by the people as worst performing due to the people's dissatisfaction that local administrative organizations and their private contractors use substandard garbage trucks and even then still do not have an adequate number of trucks for efficient waste transportation.

The people view waste disposal behavior as an initiative that needs to start from the people to encourage waste reduction, reusing and recycling. For waste reduction, the people want to reduce waste generation, believing it to be as effective as reusing. Examples of this include using both sides of styrofoam sheets and glass bottles for drinking water. However, the people gave the highest importance to recycling, exchanging their items or selling them for cash.

As for the technologies utilized in waste management, namely landfill, incineration and composting which are the responsibilities of the local administrative organizations, the people were aware most of landfill followed by composting. The people want the government to provide more knowledge and support for composting and production of bio extract that can be used to help reduce stench in landfills. Incineration had the least awareness among the people as they were lacking knowledge and understanding about it nor did they want more pollution.

People's participation in waste management is involvement in decision making, implementation, benefits and evaluation. The people gave the least importance to participation in decision making and evaluation, followed by benefits and gave the most importance to participation in implementation.

DISCUSSION

Results from both the quantitative and qualitative research conducted were consistent in finding that waste management in Phuket by waste collection from households and businesses which is the responsibility of all 19 local administrative organizations and the private contractors they hire, is on a high level of performance. Both the government and the people feel that there is still a low level of waste processing as there are still too few facilities. Waste transportation was seen to be the worst performing due to the people's dissatisfaction that local administrative organizations and their private contractors use substandard garbage trucks and do not have enough trucks to handle the large amount of garbage, leaving garbage waiting for collection and creating a stench. The government sector shares the same opinion as the people and attributes the cause of this problem to lack of budget.

In regards to technology utilization, both the government and the people feel that they do not want larger incinerators as they want to prevent higher levels of pollution. Both sectors also agree on the level of people's participation in implementation being at the highest level which also coincides with the research findings of Ngowi (1997). People's participation in benefits happens when an effective waste management system contributes to greater development and tourism for Phuket and better health for its people.

The research findings that were inconsistent between the government and the people include different ideas about waste disposal. The people feel they have very little knowledge or understanding about waste disposal processes while the government feels that it is the government's responsibility by law to provide this service and thus did not try to educate the public about waste disposal processes. The people also feel that they already are reducing and reusing waste at high levels while the government feels that the people still lack awareness in these matters as there is not enough promotion of the government's campaign to encourage the use of environmentally-friendly packaging, nor is there continuous implementation and evaluation. Recycling is seen by the people as performing at the highest level which is consistent with the findings of Kuruppuarachchi and Kalukottege (2005) and Ando and Gosselin (2005) while the government feels that recycling is performing at a low level as Phuket still lacks a recycling plant and recycling is done only through those businesses buying and selling used furniture and appliances.

In terms of technology utilization, the people want the local administrative organizations to use landfills more which is consistent with the findings of Maity *et al.* (2011), yet the government landfills are already at full capacity. The people also want the government to provide more knowledge about composting, yet the government does not give much importance to composting seeing that Phuket is a tourism economy more than an agricultural one.

The last finding that was inconsistent between the two sectors was on the topic of people's participation in the decision making and evaluation of Phuket's waste management system. It was found that the people have less participation in these matters than the government as the people do not have the opportunity to be involved in every step of the process.

CONCLUSION

Waste management in Phuket is largely the responsibility of the local administrative organizations. However, there are clear indicators that the government needs to establish better correlations with the people to create a more efficient waste management system. These indicators

include the fact that waste reduction has not been fully adopted as waste disposal behavior by the people, to which a contributing factor is lack of policies and support for continuous implementation from the government sector; the government needs to raise more awareness among the people about the technology utilization process in waste management and people's participation in the decision making and evaluation of Phuket's waste management is low as they lack opportunities to be involved in the process. The government needs to ensure that the people are provided opportunities to be involved as well as encourage the people to rethink their waste disposal behavior to reduce waste generation before it needs to be processed or disposed of by appropriate and environmentally-friendly technology utilization.

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