



# Economic incentives and social influences to separate used dry batteries at source: A lesson learned from the tourist resort of Hat-Yai, Songkhla Province, Thailand

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## Abstract

Problems related to the disposal of used batteries have dramatically increased in the last few decades with the increased use of portable devices. As batteries are usually composed of hazardous substances such as lead, cadmium and mercury, their proper disposal becomes essential. Therefore, the objective of the study reported in this paper was to discover the incentives which may directly motivate households and eventually also hospitality and tourism sector providers, to separate and dispose of used dry batteries properly in the tourism resort of Hat Yai in southern Thailand. This study employed both survey-based and action-research methodologies, in which 400 households from 59 communities were interviewed. Descriptive analysis was then used to analyse the factors likely to promote a culture of proper disposal of dry batteries. Rationality was used to compare relevant theories in the context of the study area. The study found that having convenient fixed locations for collection, particularly at community offices was the most efficient means of encouraging the recovery of used dry batteries from the community, as 88 of the respondents favoured this location. It was finally concluded that the factors motivating proper disposal are encouragement of the activity, cooperation, and time and the continuity of the activity. The main recommendation from this research is to have appropriately located collection places so as to maintain a sustainable environment.

**Keywords:** E-waste, recycling; tourism; used dry batteries, Thailand.

## Introduction

Over the last few decades, fast-growing technologies, changes in the attitudes of consumers based on greater awareness of environmental degradation and its hazards, and motivation to replace electronic and electrical equipment at faster rates, have increased the quantity of electronic waste (e-waste) (Borthakur, 2017; de Oliveira Neto et al., 2017). This e-waste may have a severe environmental impact, which is particularly important in communities that rely on their environmental resources to generate income by attracting tourists as a primary source of income. This has encouraged various countries to establish regulations to monitor e-waste, as well as to motivate the public to conduct proper recycling (Xu, et al, 2017). Developed countries such as Japan, the USA and the countries within the European Union,



especially Germany and France, have instigated recycling programs and established nationwide waste collection centres.

Hat-Yai, a popular tourist resort in southern Thailand, has recently witnessed a dramatic increase in e-waste, such as used dry batteries. This has been caused by a growth in the use of electronic materials that has not been matched by effective management of disposable items. Even though information about the effect of contamination is disseminated, this has apparently been ineffective in preventing careless separation of waste in households. Despite the fact that people may have the intention to separate waste and dispose of it correctly, this may not happen. One of the reasons for this is the non-availability of separate containers in communities for different kinds of waste, as well as a general lack of information (Pollution Control Department, 2012).

The aims of this investigation were to identify the incentives which may encourage the separation of used dry batteries in Hat-Yai municipality and to propose means by which the rate of separation of used dry batteries could be increased. This is a crucial development to ensure the escalating levels of e-waste do not have an adverse effect on the local environment and, consequently, the tourism industry which is the lifeblood of the city.

## **Literature Review**

### **Incentivising Battery Disposal**

In Europe, Resolution 91/157/EEC was presented in 1991 and was further amended in 1993 and 1998, to limit the use of hazardous substances in the manufacturing of batteries (Moura et al., 2003). Most batteries contain heavy metals, such as cadmium, mercury and lead, which are potentially damaging to the environment. If the batteries are carelessly thrown away, they may be washed out by rain and may contaminate the soil and underground water (Espinosa et al., 2004; Gu et al., 2017).

The issues relating to e-waste, such as improper recycling or disposal of used dry batteries, are more severe in developing countries such as Thailand. The problems appear to be more prominent in Thailand due to a lack of technology and resources and shortcomings in the regulations to curb the importation of foreign e-waste into the country. Recently, the Pollution Control Department (PCD) of Thailand drafted the National Integrated Strategy to regulate hazardous e-waste in order to mitigate the problems associated with it by encouraging proper treatment and informing the public about the hazards of e-waste (Sirada and Alice, 2016; Wong et al., 2007).

Different contexts and concepts affect the expression of different behaviors (Kollmuss and Agyeman, 2002). Likewise, environmental behavior depends on the context and concept of the environment. It is related to environmental understanding. This behavior is an expression of wanting to reduce or eradicate environmental damage (Stern, 2000). It can change with the stimulus from both the mind and the environment. Waste separation is a behavior that prevents environmental problems. Environmental problems must therefore be addressed in the form of behavior management. Strategies to manage the preventative behaviour should be used, so called 'antecedent strategies'. These aim to promote and protect, such as by educating, raising awareness, and campaigning for support (Bell et al., 2001). Incentives are effective in motivating people to achieve their desired behavioral goal (Slavin, 1994).

The basis of motivation is the incentive (Thondike, 1911). Slavin (1994) stated that the key to motivation is incentives, which are caused by tangible and intangible external factors, such as financial reward or increased social standing. The difficulty and complexity of



incentives is the difference between the time, the situation, and the factors that affect the motivation of the person or group. Factors related to incentives that lead to pro-environmental behavior can be divided into two groups: internal factors (e.g. environmental knowledge, awareness, attitudes, and responsibilities) and external factors (e.g. institutional, economic, social and cultural factors). Kollmuss and Agyeman (2002) said these factors are part of the incentives system and lead to pro-environmental behavior.

Therefore, increasing awareness about the separation of used dry batteries should start at source in households as these are key in the management of the disposal of e-waste. The success of recycling programs largely relies on the participation of individual households (Manomaivibool and Vassanadumrongdee, 2012; Xu et al., 2017b). Once the behavior is established, it can be expanded to community institutions, such as schools and government offices. Moreover, the development of pro-environmental behaviour requires motivation through both internal and external factors by the provision of incentives (Oreg and Katz-Gerro, 2006). These incentives should be in line with the interests of the households (social status, financial security), the community (infrastructure development, cultural diversity and opportunity), and the local authority (economic prosperity, law and order, sustainability) and they may differ from place to place based on the differences in the rules and regulations of each area. The theory of incentives (Slavin, 1991) suggests that in order to encourage the separation of used dry batteries, the relevant factors are needs, drives, arousal, expectancy, and incentives.

### **The Relationship Between Tourism and Environmental Pollution**

The global expansion of the service sector has sharpened the focus on environmental management and the impact of tourism on the surrounding environment. In a study of tourism waste generation at the Golden Triangle in Thailand, Manomaivibool (2015) found that “the promotion of source separation at public spots” is key for resource conservation and ensuring a minimal human impact on precious natural resources. This is not a new premise. Researchers have been analysing the damaging nature of unrestricted tourism for the last four decades (Karan & Mather, 1985; Kavallinis & Pizam, 1994; Bestard & Nadal, 2007).

Much of the focus on scholarly literature concerning sustainable tourism practices centres on the desire to maintain and preserve tourist attractions in the long term to ensure they survive as a benefit for future generations. Yet, “much less attention has been devoted to the problem that other industries can erode the quality of the environment that attracts visitors” (Mihalič, 2000: 65). There is a considerable short-term impact of poor environmental management and its immediate consequences for the tourism industry in affected areas (Mihalič, 2000). “For the environment-conscious tourist, the quality of the environment is of primary and direct concern rather than the environment improving efforts of the destination itself” (Mihalič, 2001: 57).

A poor environment reduces the tourism competitiveness of an attraction. All stakeholders have a vested interest in the upkeep of their locality and share the responsibility of preserving the local environment to attract as many tourists and as much income as possible. Results of a recent investigation into the role of sustainability in destination competitiveness indicated that “sustainability plays a key role in fostering tourism destination competitiveness” (Goffi, Cucculelli & Masiero, 2019). While the success of tourism destinations in developed countries is dependent on business management and local infrastructure, global studies have revealed that sustainability and environmental management are “the major competitiveness drivers in developing countries” (Knežević



Cvelbar, Dwyer, Koman & Mihalič, 2016). It is therefore clear that the improvement of sustainable practices, such as battery separation at source, can only be a positive step in a developing tourist destination such as Hat Yai.

## Materials and Methods

The research was based on a combination of a randomized survey in June 2017 and action research during the period June to November 2017. This involved 400 households from 59 communities sampled from among 103 communities, consisting of 22,571 households in the tourist resort of Hat-Yai, Songkhla Province (Sayeed, 2015). First, a survey was conducted to discover the existing behaviour of the respondents and what incentives would be effective in encouraging people to dispose of used dry batteries appropriately (Brydon-Miller et al., 2003; de Oliveira Neto et al., 2017).

The research process began with the study of the history, significance of the problem and review of literature. Then the research tools were designed, consisting of a survey of residential waste management behavior, community activity, incentives for households, and household battery collection activities. The results from the incentives for households for proper disposal from the sample were then analyzed. After that, survey results were summarised. Later, a series of activities were created to recover batteries, which were tested among community volunteers for 6 months (July – December 2017).

A questionnaire was used to obtain data from the sample of households willing to participate in the research in respect of the recovery of used dry batteries and the questionnaire also sought their reactions to three kinds of incentives: a) no remuneration, b) exchange with reward and c) point accumulation. In addition to the questionnaire, the researchers and the local schools/colleges announced to the public that incentives would be offered to those willing to dispose of used dry batteries at the drop off locations.

At the same time, the researchers sought to educate the public about the disposal of hazardous household waste by distributing information pamphlets and holding seminars with community members. Descriptive analysis was then used to analyse the factors likely to promote a culture of proper disposal of dry batteries. Logical reasoning was used to compare relevant theories in the context of the study area. Furthermore, the researchers organized activities based on answers to the survey questionnaire which had requested the organization of particular activities.

The results of the survey were interpreted to determine existing behaviours in respect of used dry battery recycling and were presented as descriptive statistics (frequency, percentage and ordering). The possible sites proposed in the questionnaire, where containers could be provided were residential areas, schools and other educational institutions, department stores, hotels, convenience stores, hospitals, fresh markets, and government offices.

## Results and Discussion

### *Separation Behaviours of Households*

The group sampled was 68.5 percent female and the majority (52.2%) were aged between 21 and 40 years. Their educational level was predominantly bachelor's degree (62.7%) and the largest group were job holders (28.7%). It was found that 40.8 percent had never separated used dry batteries from household waste and those households disposed of used dry batteries with other household waste, while the remaining 59.2 percent of the sample



separated and disposed of used dry batteries, with 23.8 percent separating them every time, 25.5 percent separating them sometimes and 10 percent rarely separating them.

**Table 1** Frequency of behaviour in separating used dry batteries by households.

Frequency of Separation		Number of Households	Percentage (%)
<b>Frequency</b>			
1	Separate every time	95	23.7
2	Separate sometimes	102	25.5
3	Rarely separate	40	10.0
4	Never separate	163	40.8
<b>Total</b>		<b>400</b>	<b>100.0</b>
<b>Separation Behaviour</b>			
1	Never separate	47	19.8
2	Put into separate bag but mixed with household waste later	108	45.6
3	Put into separate bag and pass to household waste truck	21	8.9
4	Put into container provided	23	9.7
5	Put into red container (hazardous waste)	35	14.7
6	Bury around the house	3	1.3
<b>Total</b>		<b>237</b>	<b>100.0</b>

Out of the 237 households which separated used dry batteries from other waste and disposed of them separately, 45.6 percent separated them in a bag but mixed them with household waste later. 14.7 percent put them into a red container for hazardous waste, 9.7 percent put them into a container provided, 8.9 percent put them into a separate bag and passed them to the household waste truck, and 1.3 percent buried them around the house, while 19.8 percent did not separate them at all. The frequency of separation by households is illustrated in Table 1.

#### *Incentives for Households for Proper Disposal*

Interviews were then conducted with the leader of each community to discover the most effective incentives to develop a culture of proper disposal of used dry batteries. The proposed incentives were:

- 1) Collection of the used dry batteries directly from the households
- 2) Collection on a set date and/or at a set place.
- 3) Mailing them to a specified postal address
- 4) Selling them back/gaining a reward for proper disposal
- 5) Accumulating points which can be exchanged for rewards.

For the favoured place of disposal, the results showed that more households considered that the community office was the place best suited to the disposal of used dry batteries, with convenience stores second, followed by place of residence, department store, government office, school or other educational institution, fresh markets, hospitals, and hotels. The details of these preferences are provided in Table 2.



**Table 2** Number and percentage of household favouring each method of disposing of used dry batteries.

Activity and Place		Number of Households	Percentage (%)
<b>Activity</b>			
1	Collection by staff	88	22.0
2	Collection by staff on a set date and/or place	27	6.7
3	Collection by staff at a specified place	151	37.8
4	Sending to a specified postal address	27	6.7
5	Selling back	40	10.0
6	Exchanging for a reward	1	.3
7	Exchanging with points for a reward	58	14.5
8	Disposal with household waste	8	2.0
<b>Total</b>		<b>400</b>	<b>100.0</b>
<b>Place for disposal*</b>			
1	Residence	139	17.5
2	Community office	167	21.0
3	School/educational institution	59	7.4
4	Department store	113	14.3
5	Hotel	13	1.6
6	Convenience store	152	19.1
7	Hospital	33	4.2
8	Government office	82	10.3
9	Fresh market	36	4.6
<b>Total</b>		<b>794</b>	<b>100.0</b>

\* Respondents could choose one or more

Based on the opinions of the 400 respondents relating to incentives for separating and disposing of used dry batteries, 370 (92.5 %) wanted to participate in the activity. Moreover, the respondents did not expect to be rewarded for this activity. Therefore, after disseminating information on the effect of contamination from hazardous waste and exchanging ideas with the leaders of the 103 communities in the tourist resort of Hat-Yai, the researchers decided to collect the used dry batteries from both the communities which expressed interest in participating in the project, as well as those who did not intend to participate. The place of collection was decided based on the advice of representatives from the communities. As noted above, the survey found that the community office was the most acceptable location followed by convenience stores and residences, but additional places were proposed by the representatives of the communities.

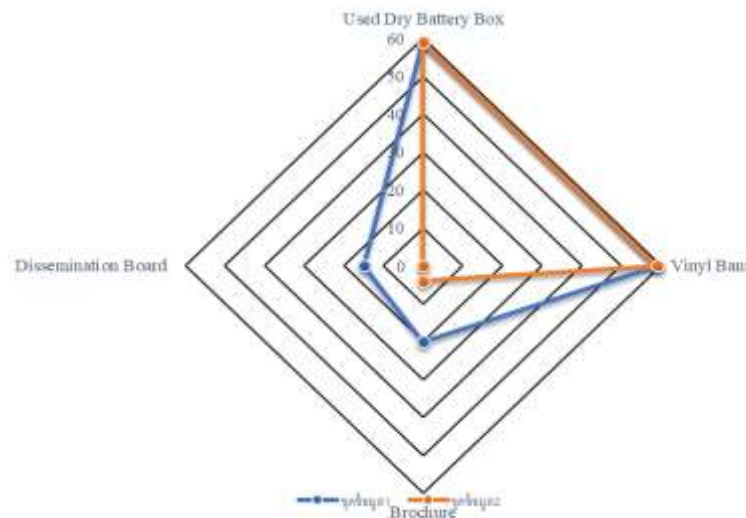
### *Collection Activities*

Activities to support the collection of used dry batteries were developed based on the suggestions and opinions of the representatives from each community. The activities were divided into the following three groups:

- a. Collection Activities. There were 103 participating communities but only 78 community-based research areas. The main type of activity was the collection of batteries by staff at community offices, based on the findings of the survey. No rewards were offered for disposal in this manner.
- b. Providing basic knowledge about separating and disposing of used dry batteries from households. Out of the 78 communities constituting the research areas only

55 communities participated in this activity. Information was also collected based on the opinion of members of the communities about the collection of used dry batteries by staff at a specified place.

- c. Incentives for separating and disposing of used dry batteries from households. There were 59 participating communities all of whom received a toolkit consisting of 7900 ml. used-dry-battery disposal boxes, vinyl banners, leaflets and dissemination boards about the disposal and management of used dry batteries.



**Figure 1** Comparison of the number of toolkits encouraging the collection of used dry batteries distributed (Series 1: Blue) and the number of kits actually used in communities (Series2: Orange)

After the delivery of the toolkits, the collection of used dry batteries continued for a six-month period. Initially, after the toolkits were delivered, the waste collection boxes were installed, public announcements were made, brochures were distributed, and appointments were made for seminars to disseminate information. After the passage of one-month, additional waste collection boxes were installed, damaged boxes were replaced, some used dry batteries were collected from communities as properly managed waste and informal interviews with some residents were conducted in the vicinity of the waste collection boxes. After the passage of two months, where additional waste collection boxes had been requested, they were installed in some schools etc. More brochures were distributed and each week, the researchers or their assistants collected used dry batteries from the ten communities and informally interviewed people in the vicinity of the waste collection boxes. The same procedure was repeated after the passage of the third month, with the additional collection of used dry batteries at that time and this continued through the fourth, fifth and sixth months.

### Conclusions and Recommendations

This study surveyed the types of activity preferred by communities and households in separating and collecting used dry batteries. Following the survey, a project was conducted where toolkits were given to communities consisting of collecting boxes and information to disseminate about the importance of the separation and disposal of batteries in the boxes provided. The project lasted six months and batteries were collected every month.



The survey of 400 households in the tourist resort of Hat-Yai established that people do not expect any reward for disposing of used dry batteries but expect a clearly specified place of collection, with the community office being the place most favoured in the survey. Collection points far from the community e.g., at a department store, were not favoured by people in the communities. Of the people surveyed 92.5 percent expressed the intention to dispose of batteries in the boxes provided. From the 103 communities in Hat Yai, 78 communities participated and held seminars to disseminate information about the importance of separating and collecting used dry batteries. However, only 59 communities participated in the collection of used dry batteries. It was noted that there were no additional requests for brochures and the communities preferred using public announcements in the community.

From the interviews conducted, many people expressed the view that the amount of disposable batteries from the households were insufficient to justify a scheme whereby points are accumulated and exchanged for rewards. Therefore, reward-based activities would not encourage the separation and disposal of used dry batteries from households. It was notable that the question of the treatment or eventual disposal of batteries after the collection was frequently raised by the participants.

There are three main drives which encourage households to separate and dispose of used dry batteries in collection boxes:

- a. Activities relating to the collection must be clearly advertised: The activities encouraging collection must be clearly announced, collecting boxes provided, and batteries must be regularly collected by staff.
- b. Cooperation: If the members of the community participate actively then the results will likely be better as compared to communities where the members do not actively participate. The researchers noted the enthusiasm and interest of some communities and their attention and efforts to expand household waste management within the community. This kind of cooperation results in an intention to act among households. They are influenced by both internal and external factors which give them incentives to act and makes them positive and motivates them.
- c. Time and continuity of the activity. It is important for people in the community to see that the batteries placed in the collection boxes provided are regularly collected by staff who arranged for their proper disposal. Pro-environmental behaviours result from a willingness to act. Intentions need to be cultivated and previewed and people need to take time and to persevere. It takes a long time to turn intention to act into pro-environmental behaviours but once established they will become long-term behaviours.

The results of this research are consistent with previous models of pro-environmental behaviour such as models relating to environmentally responsible behaviour, which have shown the importance of internal factors influencing behaviour change [Hines et al., 1987]. Further, Kollmuss and Agyeman (2002) showed that external and internal factors act as both direct and indirect influences on pro-environmental behaviour and that indirect influences can cause change in old behaviour patterns or habits.

The first part of this research showed that although most households in the tourist resort of Hat-Yai have knowledge about the management of household waste, that knowledge does not act as an incentive for the separation and disposal of waste batteries. However, the research provided incentives to motivate households to behave responsibly by separating and disposing of used dry batteries. with the second part of the research involving actively separating and disposing of used dry batteries, facilitated and guided by the materials in the





toolkit. The survey established that the place for disposing of the used dry batteries must be in a convenient and accessible location, and that social influence can work to influence people who observe other households acting responsibly and thus function as community prototypes.

These factors together provide internal and external incentives which need time to develop people's level of consciousness about the management of hazardous waste and to motivate the forming of the good habits and actions constituting pro-environmental behaviour among households. Moreover, activities relating to collection must be clearly advertised in order to ensure cooperation and the continuity of the activity.

This investigation provides data that will be useful to the local authorities in Hat Yai for raising the competitiveness of the tourist resort as a holiday destination by encouraging sustainable living practices. It is recommended that future research is conducted which is able to build upon this investigation and identify other avenues to promote sustainable living practices among the residents of Hat Yai that can contribute to a cleaner and more attractive tourist image.

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