Thai Environmental Engineering Journal Vol. 33 No. 3 (2019) : 17-25
www.eeat.or.th

Management Model of Mobile Phone Waste of Selling and Repair Shops in Municipality of Ratsada Subdistrict, Mueang District, Phuket Province

Tidarat Kumlom* **and Chadaporn Pansa**
Department of Environmental Science, Faculty of Science and Technology,
Phuket Rajabhat University, Phuket 83000, Thailand
*E-mail : tidarat.k@pkru.ac.th

Abstract

The objectives of this study were to 1) study the management model of mobile phone waste of operators, repair shops and mobile phone dealers and 2) study the problems / suggestions of operators, repair shops and mobile phone dealers. This study was a survey research using questionnaire to study the mobile phone management model of mobile phone repair shop and service provider. Data from June - August 2017 were analyzed for frequencies and percentages. There were 26 establishments in the municipality of Ratsada Muang Phuket. Most entrepreneurs were male. In terms of age, 57.70% and 23.08% were in the range of 26-30 years and 31-35 years old, respectively. Their educations are mostly of Diploma / equivalent level 53.85% and 76.92% had been in business for 1-5 years. The study of mobile phone management model indicated that the major part of mobile phone was the circuit board and the mask accounted for 18.52%. For the management of the wastes, 92.30% ownership of establishments were responsible and 40.94% know how to properly handle by reusing. Problem and suggestions of mobile phone management model emphasized the need to receive information; 92.30% of the respondents wanted to receive news from television, 30.77% had problems of handling mobile phone wastes, 61.54% had problems because they had no place to store and no knowledge of management, 25.8% wanted to solve the problem by training, 29.83% needed training were collectors or managers of mobile phones. About 80.77% of entrepreneurs supported the municipality. In the case of the mobile phone screening project, 57.70% of the respondents were willing to pay for the service. The entrepreneur wanted to have a business responsibility for the disposal and storage of mobile phones in the future.

Keywords : Mobile Phone Waste; Operators; Repair Shops and Mobile Phone Dealers; Reuse

Introduction

Presently, some many modern technologies and advances that occur to meet the needs and convenience of human daily life. With the variety of technology developing rapidly, it causes the unceasing consumption of electronic products and it was distributed to all people. The development of the electronic. Industry makes many types of electronics obsolete quickly.

Technological advancement also speed up electronic products outdate rapidly, which make the highest change rate. The average service life of mobile phones is 18 months. Lifespan combined with the number of mobile phone users, that currently, more than 1 billion people worldwide are increasing while e-waste is also increasing at the same time [1]. According to the Pollution Control Department which collects statistics data of electronic waste 2016, it was found that, in Thailand, there was an increase in the amount of e-waste more than 20 million units and is likely to increase by 10 percent per year, especially mobile phones have a high volume of 10.9 million pieces. It was considered such highest amount because of these electrical appliances and electronic devices have developed rapidly and had a short service life. Most electronic waste contains hazard heavy metals such as lead, mercury, cadmium, arsenic, sulfur, and other chemicals. Besides, it is found that a large amount of electronic waste is smuggled from foreign countries into Thailand. The electronic waste was sent to the villagers in the community to sort, disassemble, and then metals were sold. The remaining of electronic waste was disposed of by incineration or landfill. In this regard, an improper incineration and disposing of electronic waste would cause environmental, community and health problems as well as safety in the occupation of those directly involved.

Moreover, people or electronic products users still lack knowledge and understanding of the dangers of electronic waste. These things, though, have been closed to them, they do not know the e-wastes' impact to health. Therefore, they do not know what the harmful will occur [2].

Ratsada Subdistrict Municipality is a community that provides relatively high expansion of services in commerce and industries due to the expansion of the adjacent area, Phuket Municipality. This Subdistrict Municipality still cover sufficient space for economic growth, as seen by the population growth and many projects of housing estate development [3]. The number of mobile phone repair and sell shops had been increased to meet the needs of the people. These shops have provided repairing services for the damaged mobile phones. If there is a good management model, which is the basic knowledge to manage mobile phone waste problems. The problems and dangers of electronic waste affecting humans and the environment will be reduced.

The study of management of mobile phone wastes generated by the sale and repair phone shops in Ratsada Subdistrict Municipality, Mueang District, Phuket Province aimed to get information about mobile phone waste disposal management. Then, the information was assessed in terms of consistency with the proper methods that do not affect health and the environment. The problems/suggestions from the operators of the mobile phone sale and repair shops were studied. The study results could be used as a guideline for operators to protect their health from the hazardous substances which have limited content releasing into the environment.

A study of the management of mobile phone waste is repaired and sale phone shops in Ratsada Subdistrict Municipality, Mueang District, Phuket Province aim to get information about mobile phone disposal management of repaired and sale phone shops. Then the information was assessed consistent with the proper methods and do not affect health and the environment. The problems/suggestions from operators of mobile phone repair and sale shops were studied. The results of this research can be used as a guideline for operators to protect their health from hazardous substances and these substances were limited in releasing into the environment.

The study area covered the mobile phone repair and distribution shops in Ratsada Subdistrict, Mueang District, Phuket Province. There was a total of 26 shops in 6 villages [4] as follows

1. Ban Koh Sirey, including, Nong May mobile, Nishakorn mobile, Roumpol mobile, Taweelab, and Kit Phadoong Suesarn.
2. Ban Bang Chi Lao including Eufa mobile, T.N shop 2, and Master mobile.
3. BanGugu including, D-day mobile, Mister mobile, Charoenpol mobile, J.K telephone, and Mai mobile.
4. Ban Thung Kha Paniang Teak, including, Master mobile 2, and Tep I.T.
5. Ban Lak Kongsi, including, No name mobile, P.T mobile, and Moji phone.
6. Ban Ta rue mai, including, Cyber phone, Choke mobile, Tepi mobile, Tawee silp suesarn, Variety phone, No one best technology, and Pe Ko mobile.

Materials and Methods

This research was the survey research. Data taken from the operators of mobile phone sale and repair shops were collected by using questionnaires. The sampling area was in Ratsada Subdistrict Municipality, Mueang District, Phuket Province. The study steps are as follows

1. Study of the information about mobile phone wastes and how to manage them by reviewing the related documents and research in various publications; including books, articles, journals, and internet. The relevant important topics were summarized and embraced in this study.
2. Scoping the study area including 26 mobile phone repair and sale shops in Ratsada Subdistrict Municipality, Muang District, Phuket Province.
3. Creating tools for research

1) Tool characteristics: It is a closed-end and open-ended questionnaire with the choosing answer and fills in the blank.

2) Create a tool with the following steps; Collect related questions, define the format of the closed-end and open-ended questionnaires. The questionnaire consists of 3 parts: Part 1 is about general information of the respondents. Part 2 is about the management method of mobile phone waste in the mobile phone repair and sale shop. Part 3 is about problems/suggestions for managing mobile phone waste. The questionnaire used for collecting data has a reliability of 0.825. (Cronbach' s Alpha)

4. Scoping targets with a specific audience (Purposive Sample), which must be the operator of the mobile phone repair and sale shops in Ratsada Subdistrict Municipality, Mueang District, Phuket Province. All the shops were surveyed because there was a small number of shops, so the researcher collected data from all 26 shops.
5. Data collection and data analysis: The data were collected by questioning the target group, namely, operators of mobile phone

repair and sale shops in Ratsada Subdistrict Municipality, Mueang District, Phuket Province. Finally, the obtained data were analyzed and calculated the frequency and percentage.

Results and Discussion

General Information

General information of the operators of 26 mobile phone repair and sale shops in the studied Subdistrict Municipality are as follows; they were male as 57.70%, the highest percentage was the age in the range of 26-30 and 31-35 years old as for 23.08%. The most educational level was diploma/equivalent as 53 53%. The operation time of the business mostly in 1-5 years, accounted for 76.92%.

The shop owners mostly open the shop and operate the mechanic themselves. The studied entrepreneurs had knowledge with ability in particular fields, so they could do the mechanic work. The service time of the shops was in the range of 1-5 years.

This study result was consistent with the results of Waewsri (2014) [5] on the decision factors of the consumer in Bangkok on buying a smartphone indicated that modernity was the concept of buying and using smartphones of consumers. Another factor was machine intelligence. Such factors were the causes of smartphones changing, so that there were several mobile shops increasing today.

Type of Mobile Waste

As shown in Table 1, there were 2 types of mobile phone debris existing the most composites ie, circuit board and phone mask, represented equally as 18.52%, followed by batteries 17.78%, liquid crystal 16.30%, speakers 11.11%, keypad 7.41%, signal conductor 5.18%, microphone 2.96%, voltage adaptor 2.22%. Type of mobile phone waste is presented in Figure 1.

Table 1 Mobile Phone Waste in Mobile Phone Repair and Sale Shops

No.	Type of mobile phone waste	Frequency (F)	Percent (%)
1	Circuit board	25	18.52
2	Liquid crystal display	22	16.30
3	Speakers	15	11.11
4	Microphone	4	2.96
5	Phone mask	25	18.52
6	Keypad	10	7.41
7	Signal conductor	7	5.18
8	Voltage adaptor	3	2.22
9	Batteries	24	17.78
Total		**135**	**100**

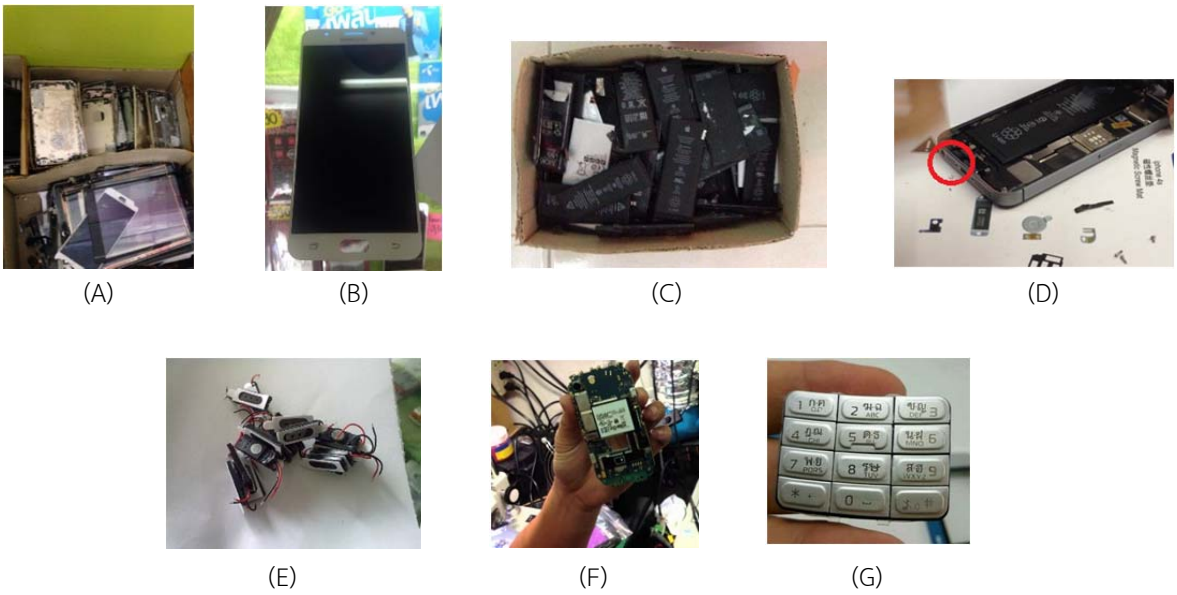

Figure 1 Type of mobile phone waste (A) Phone mask (B) Liquid crystal display (C) Batteries (D) Speakers (E) Microphone (F) Circuit board (G) Keypad

As stated above, two types of mobile phone scraps were circuits and mask accounted for 18.52%, which is consistent with the study of Chanthongmae (2007) [6] who studied hazardous waste management of electric repairing shops in Phuket Municipality, Phuket Province. They found that the most hazardous waste presented was the circuit as the circuit is the main part of various devices making function on a mobile phone work. So, the circuit is necessary part of the mobile phone. The mobile mask frequently changes due to it is broken. If the mobile phone is damaged, it is necessary to fix it by professional persons. Most of professional persons have a long time working and more experience in fixing. The least common type of mobile phone scraps was the voltage adaptor accounted for 2.22%. The voltage adaptor is a simple device used to charge the battery. It is less damage along with the service life of a mobile phone. When changing or repairing mobile phones, mobile phone waste cannot be reused. The shop owner is responsible for managing mobile phone waste. Since the shop owner is the operator and the mechanics, it is the responsibility of managing the mobile phone waste.

Mobile Waste Management

Regarding mobile phone waste management, 4 types of waste management including reuse, selling, municipal proper disposal, recycle are presented in Table 2.

Table 2 Mobile phone waste management

No.	Type of mobile phone waste	Mobile phone waste management								Total	
		Mixed discarding		Reuse		Selling		Proper municipal disposal			
		F	%	F	%	F	%	F	%	F	%
1	Circuit board	-	-	21	80.77	5	19.23	-	-	**26**	**100**
2	Liquid crystal display	-	-	3	13.04	20	86.96	-	-	**23**	**100**
3	Speakers	1	5.88	13	76.47	3	17.65	-	-	**17**	**100**
4	Microphone	3	20	9	60	3	20	-	-	**15**	**100**
5	Phone mask	8	32	1	4	16	64	-	-	**25**	**100**
6	Keypad	-	-	11	64.71	6	35.29	-	-	**17**	**100**
7	Signal conductor	-	-	9	60	6	40	-	-	**15**	**100**
8	Voltage adaptor	-	-	3	37.5	5	62.5	-	-	**8**	**100**
9	Batteries	20	80	-	-	4	16	1	4	**25**	**100**
Total		32	18.71	70	40.94	68	39.77	1	0.58	171	100

Note: F = Frequency

However, as seen in Table 2 the most conventional mobile phone management included at least 2 means indicated as follows. Circuit board employed reuse 80.77%, selling 19.23%. Liquid crystal employed reuse 13.04% and selling 86.96%, Speakers employed 76.40%, selling 17.65%, and mixed discarding 5.88%. Microphones employed reuse 60.00%, selling 20.00%, and mix-discarding 20.00%. Phone mask employed reuse 4%, selling 64%, and mix discarding 32%. Keypad carried out reuse 64.71% and selling 32.59%. Signal conductors carried out reuse 60%, selling 40%. Voltage adaptor had reuse 32.5% and selling 67.5%. Batteries were mostly handled by mixed discarding 80%, selling 16% and properly disposing 4%. The most common method of managing a mobile phone waste was reuse accounted for 40.94% followed by selling as for 39.77% and only 0.58% for proper municipality disposal. Noting that such management methods could reduce the amount of mobile phone waste as well as disposal of mobile phones that affect the environment, which is consistent with the study results of Hunsom (2007) [7] conducted a study on the simultaneous recovery of precious metals from the mobile phone batteries by using acid leaching process. The heavy metals of mobile batteries were separated and used again. From such research hydrochloric acid provide the best leaching result. The heavy metal from leaching must be extracted into the pure metal which is utilized as a catalyst in the future.

Regarding the waste management responsibility, mobile phone waste, due to changing or repairing mobile phones, could not be reused. The shop owner is responsible for managing mobile phone waste. Since the shop owner is the operator and the mechanics, it is the responsibility of managing the mobile phone waste. As shown in Table 3, presents that the person who are responsible for managing the mobile phone waste was the owner accounted for 92.30 percent, and payee/ repairman that account for 7.70%.

Table 3 The person who responsible for managing the mobile phone waste

No.	The person who responsible for managing the mobile phone waste	Frequency	Percent
1	Owner	24	92.30
2	Payee/ Repairman	2	7.70
Total		**26**	**100**

Operator Requirement

Based on this study, it indicated that the operators of repair and sale shops need information about mobile phone waste management in a proper way accounted for 92.30%. The media for information about mobile phone waste management was television as for 30.77%. The operator faced problems with mobile phone waste management about 61.54%. Most of the problems was the lack of storage place and knowledge of mobile phone waste management about 25%. The solution needed was the knowledge of training method accounted for 29.83%. Most of the respondents required the collecting and mobile phone waste management from Ratsada Subdistrict Municipality as for 80.77%. If there is a project about mobile phone waste sorting, they were willing to pay for the service fee, accounted for 57.70%. The operators extremely required the service organization for collection and disposal of mobile phone waste in the future accounted for 24.14%.

In addition, the study of awareness and behavior on mobile phone waste management, case studies of the youth in Bangkok, showed that the youth group who received the information had higher awareness of waste management than those who did not receive the information. The television media provided higher awareness of waste management than other media sources as television is a communication device that many people living in various areas can access thoroughly in time and reliable. Television media can display video and audio at the same time. This makes people more understand the information than other media.

Regarding the problems faced by the operator about no place for storage of the mobile phone waste. Since the business area is not spacious, mobile waste do not need storage. Another problem was the lack of management knowledge which is consistent with the study results of Tantipalakul (2016) [9] who researched the situation of electronic waste management of government and people in Bangkok. It revealed that the people still lack knowledge and understanding about electronic waste management as the law is not evident, the penalties are not serious, and lack of strong law enforcement. Most entrepreneurs want a solution to the problem by getting knowledge through training arranged by the relevant departments. Most of respondents (80.77%) want training by the Ratsada Subdistrict Municipality. Regarding the knowledge on hazardous waste management, Pollution Control Department had prepared a guide for the management of community hazardous waste for the administrators of local government organization. It is used as a guideline for management planning. Because Ratsada Subdistrict Municipality, who is responsible for all Ratsada Subdistricts, has sufficient knowledge and has the power to supervise the area, therefore, there is a project about providing knowledge about

mobile phone waste management. There is a meeting with village leaders and related persons to attend and create preventive measures, control, supervise and exchange knowledge on mobile phone waste management to reduce the occurrence of impacts. The owners want to establish the workplace that is seriously responsible for the disposal and storage of mobile phone waste, in the future, accounted for 24.14%. It has to be cooperated in all relevant sectors, including government, private sectors, and shop owners to reduce the impact caused by mobile phone waste. In the future, the government should organize activities to raise awareness and impact of mobile phone waste for people. There are measures to control and should support the data collection in all areas or other municipalities to compare the various data. The private sector is factories, which are registered legally, that provide waste disposal services and unused materials. This includes the phone manufacturers that are responsible for managing the mobile phone waste. The result is consistent with Ongardvanich (2012) [11] who studied the responsibility of manufacturers to manage electric waste and electronic products in Thailand. The result showed that in many industrial countries, especially the European Union, legislation has long been in line with the manufacturer's responsibility. Manufacturers are designated to be responsible for managing electric waste and electronic products. Because the manufacturer knows best about the manufactured product. Therefore, manufacturers have a role in the product from the beginning of the procurement of raw materials until the management of the produced waste. Operators are responsible for sorting and disassembling mobile phone parts for easy handling and collection for proper disposal.

Conclusion

A study of the mobile phone waste management method of mobile phone repair and sale shops In Ratsada Subdistrict Municipality, Mueang District, Phuket Province, found that the circuit boards and phone masks were the higher component than other parts as mobile phone wastes generated equally as for 18.52%. The business owner was responsible for managing the mobile phone wastes for 92.30%. Management method employed reuse as for 40.94%. According to the study of problems/ suggestions on the management of mobile phone waste, the needs for useful information was 92.30%. Needs to receive the information on television was 30.77%. Problem of managing the mobile phone waste was 61.54%. Such problems was due to lack of storage space and lack of management knowledge 25%. Solution to problems by knowledge training was 29.83%. Ratsada Subdistrict Municipality was the main unit that collected and managed the mobile phone waste accounted for 80.77%. If there is a project about mobile phone waste sorting, they were willing to pay a service fee, accounted for 57.70%.

Acknowledgment

Thank you to all respondents from the mobile phone repair and sale shops in Ratsada Subdistrict Municipality, Mueang District, Phuket Province, for taking the time and providing useful information in this research.

References

[1] Office of the Environment Region 16. 2016. Disposable electronic waste. Retrieved March 25, 2017, from

http://reo16.mnre.go.th/reo16/knowledge/detail/211

[2] Department of Pollution Control. 2017. Manual for managing hazardous waste from the community for local administrative organizations. Bangkok: Active Print Co., Ltd.

[3] Ratsada Subdistrict Municipality. 2016. Basic information of the area. Retrieved March 10, 2017, from http://www.rasada.go.th/index.php?options=information&catid=1

[4] Phuket Business Development Office. 2016. Business registration. Retrieved March 10, 2017, from http://www.dbd.go.th/phuket/main.php?filename=index

[5] Tharathip Waewsri. (2014). Factor Affecting Consumer Buying Decision of Smart Phones in Bangkok. Rajamangala University of Technology Thanyaburi.

[6] Rachanee Chanthongmae. 2007. Hazardous waste management of electrical equipment repair shops in Phuket Municipality Phuket: Phuket Rajabhat University.

[7] Mali Hunsom. 2007. Reciprocity of precious metals from waste, mobile batteries with acid-washing process: Faculty of Science Chulalongkorn University.

[8] Prayuth Suwansri. 2013. Awareness and Behavior on Mobile Phone Hazardous Waste Management: A Case Study among Youth in Bangkok Metropolitan: Rajamangala University of Technology Phra Nakhon.

[9] Mok Tantipalakul. 2016. Situation in electronic waste management of government and people in Bangkok: Siriraj Piyamaharajakarun Hospital.

[10] Department of Pollution Control. 2010. Manual for managing waste electrical and electronic products. Bangkok: Thai Effects Studio Co., Ltd.

[11] Thitikan Ongardvanich. 2012. Product Responsibility Concerning the Management of Waste Electrical and Electronic Equipment in Thailand. Thammasat University.