

CHAPTER II

REVIEW OF LITERATURE

This research reviews some theories related to solid waste, solid waste separation, solid waste management, awareness, communication and media exposure.

Solid Waste

Public Health Act defined that waste is the residuals from production process and consumption in forms that are ruined or not needed. Some are solid wastes that could proliferate in spread of diseases and cause environmental problem. Thus, solid waste refers to residuals of paper, clothes, left over food, discarded, plastic bag, dung, etc. (Department of Environmental Quality Promotion, 2005).

Shah (2000) defined solid waste as garbage, refuse, sludge from a waste water treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities.

Nathanson (1997) describes that any material that is thrown away or discarded as useless and unwanted is considered solid waste.

Types of Solid Waste

Energy and Resources Institute (2005) classified solid waste into different types depending on their source:

1. Household waste is generally classified as municipal waste.
2. Industrial waste as hazardous waste.

3. Biomedical waste or hospital waste as infectious waste.

Municipal solid waste

Municipal solid waste consists of household waste, construction and demolition debris, sanitation residue, and waste from streets. This garbage is generated mainly from residential and commercial complexes.

Hazardous waste

Industrial and hospital waste is considered hazardous as they may contain toxic substances. Certain types of household waste are also hazardous. Hazardous wastes could be highly toxic to humans, animals, and plants; are corrosive, highly inflammable, or explosive and react when exposed to certain things e.g. gases.

Household wastes that can be categorized as hazardous waste include old batteries, paint tins, old medicines, and medicine bottles.

Hospital waste contaminated by chemicals used in hospitals is considered hazardous. These chemicals include formaldehyde and phenols which are used as disinfectants, and mercury which is used in thermometers or equipment that measure blood pressure. In the industrial sector, the major generators of hazardous waste are the metal, chemical, paper, pesticide, dye, refining, and rubber industries.

Hospital waste

Hospital waste is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biological materials. It may include wastes like sharps, soiled waste, disposable, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and

can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected.

Sources of Solid Waste

Tchobanoglous (1993) defined that sources of solid wastes in a community are, in general, related to land use and zoning. Although any number of source classifications can be developed, the following categories are useful: (1) residential, (2) commercial, (3) institutional, (4) construction and demolition, (5) municipal services, (6) treatment plant sites, (7) industrial, and (8) agricultural.

Problems Associated with Solid Waste

The problems associated with solid waste in our society today are complex because of the quantity and diverse nature of the waste. They can affect the environment and public health as follows:

Henry (1996) states that under warm and moist conditions, organic wastes become ideal breeding places for disease-causing organisms. With solid wastes, flies, rodents, and mosquitoes are the primary vectors for disease transmission. The major diseases of concern that are associated with flies and mosquitoes are gastroenteritis, dysentery, hepatitis, and encephalitis.

However, the enervation of harmful organisms and their transmission are not the only health-related concern. Many potentially harmful materials, such as solvent and pesticide containers, medical wastes, and asbestos debris, even though prohibited, may already be present in waste when it is collected.

Air pollution, caused by the particulate and gaseous pollutants from landfill sites and municipal incinerators, is an additional environmental problem related to solid waste disposal.

Furthermore, land filling of solid wastes or the residues from incineration, endanger the quality of groundwater or surface waste supplies.

Nathanson (1997) describes that improper disposal of solid waste can cause serious environmental or ecological damage. Air pollution can result from inadequate solid waste integration. Soil contamination, as well as surface water and groundwater pollution, can be caused by the disposal of solid waste in improperly built landfills. These kinds of pollution can lead to a variety of diseases in humans, thereby threatening public health.

Solid waste can harbor rodents and insects, which may act as vectors of infectious diseases such as typhoid, plague, and sedentary. In addition, waste deposited in open dumps causes a variety of nuisances, including odor, fire hazards, and windblown debris. The increasing amount of solid waste causes the difficulty in finding sites of new processing and disposal facilities. To solve the problem, solid waste management activities comprise a multibillion-dollar per year industry in the United States.

From data about solid waste problems, it is concluded that solid waste is threatening the public health and the environment. In addition, it requires high cost to solve.

Solid Waste Separation

Tchobanoglous (1993) defined solid waste separation as a solid waste management practice of separating and storing different materials found in solid waste in order to promote recycling and re-use of resources and to reduce the volume of waste for collection and disposal.

Energy and Resources Institute (2005) said that household waste should be separated daily into different bags for the different categories of waste such as wet and dry waste, which should be disposed of separately. One should also keep a bin for toxic wastes such as medicines, batteries, dried paint, and old bulbs. Wet waste, consisting of leftover foodstuff, vegetable peels, etc., should be put in a compost pit and the compost could be used as manure in the garden. Dry

waste consisting of cans, aluminum foils, plastics, metal, glass, and paper could be recycled. And it classified waste into 2 types as biodegradable and non-biodegradable.

Biodegradable waste includes organic waste, e.g. kitchen waste, vegetables, fruits, flowers, leaves from the garden.

Non-biodegradable waste can be further separated into:

- Recyclable waste - plastics, paper, glass, metal, etc.

- Toxic waste - old medicines, paints chemicals, bulbs, spray cans, fertilizer and pesticide containers, and batteries.

- Soiled - hospital waste such as cloth soiled with blood and other body fluids.

Solid Waste Management

Management can be defined as the carefully planned, judicious use of means to achieve an end. In this case, an “end” is the removal and disposal of unwanted material. To achieve this, technical, environmental, administrative, economic, and political problems must be solved. The effort to address these problems is usually referred to as the practice of solid waste management. It involves management of activities associated with generation, storage, collection, transfer and transport, processing and disposal of solid waste, which are environmentally compatible adopting principles of economy, aesthetics, energy and conservation. It encompasses planning, organization, administration, financial, legal and engineering aspects involving interdisciplinary relations (Shah, 2000).

So solid waste management may be defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid waste in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics and other environmental considerations and that is also responsive to

public attitudes. In its scope, solid waste management includes all administrative, financial, legal, planning and engineering functions involved in solutions to all problems of solid waste. The solutions may involve complex interdisciplinary relationships among such fields as political science, city and regional planning, geography, economics, public health, sociology, demography, communications and conservation as well as engineering and materials science (Tchobanoglous, 1993).

Elements of Solid Waste Management

Bhude (1984) classified functional elements of solid waste management into 6 groups as following:

Generation

Wastes differ in the rate of generation, quantity and quality depending upon the area of generation. The quantity and quality from residential areas may not vary appreciably. On the other hand, wastes from commercial and industrial areas may vary in quality and quantity at different times of the year. This will have a marked effect on the selection of method for its collection, processing and disposal.

Storage

The generated waste is stored within the premises in commercial and industrial areas whereas in residential areas, occupants take it out and transfer to community storage bins.

Collection

Citizens deposit the wastes by the roadside from where the conservancy staff transfers it to the community bins using wheelbarrow or other equipment. For developing countries which need a large number of workers and small number of equipment.

Transportation

The material collected in community dustbins is transferred to transport vehicles for transport to the processing or disposal site. The fleet of transport vehicles should have sufficient capacity for average and peak loads and should be utilized at optimum levels. In big cities the material is conveyed to a transfer station from where another set of vehicles transport it further. This movement of vehicle is often taken as a part of collection as the vehicles collect waste from individual sources (house). In most of the developing countries, the waste is collected from well-dispersed discrete points and hence referred to as transportation.

Processing and recovery

A large quantity of waste has to be processed before suitable disposal to reduce its potential nuisance value. Occasionally recovery of useful constituents is also carried out as an independent process.

Disposal

The waste may come for disposal either directly after its transportation, or after processing. Disposal could be on land or water logged areas for reclamation. The different functions are interdependent and interrelated, which could be better managed by a systems approach. Disposal method costing less may not always be the best, which may be offset by higher transport or processing cost.

Solutions of Solid Waste Problems

Bangkok Metropolis where serious solid waste problems occurred, Pollution Control Department (PCD) energetically finds out the solutions as follows (Pollution Control Department, 2000):

1. Promoting public participation. Since people are solid waste generators, they should

be concerned in solving the problems. Thus PCD makes a policy to promote public participation in maintaining Bangkok cleaning for better environment and life through various campaigns.

2. Increasing the efficiency of solid waste collection. At present there are two methods of solid waste collection that PCD uses:

- Direct collection refers to the collection from household and any places by PCD staff or by solid waste owner's disposal in the waste trucks or boats.

- Indirect collection means PCD staff collects solid waste from containers which are placed along the roads and the areas of high amount of waste such as markets or shopping centers.

3. Cooperating with private sectors. To solve the serious problem of solid waste, PCD cooperates with private sectors in planning, as well as running various projects in the contract of roads and building cleaning, solid waste collection and infectious waste elimination, etc.

4. Improving the efficiency of solid waste elimination. Since the amount of solid waste is increasing year by year, the land filling might not be the effective method to handle the problem in the future. In addition, there might be problems in finding a new location for land filling, and environmental impacts such as soil and water pollution. Therefore, PCD created the integrated solid waste elimination project at On-nuch solid waste elimination center (On-nuch project 1) by using three systems as follows:

- Solid waste separation system
- Composting
- Incineration system by transforming solid waste to be an electronic power in solid waste elimination.

5. Developing the working system. Beside the above solutions, PCD developed the working system by operating Geographic Information System (GIS) in solid waste management. After filling the data in GIS as database, the system helps PCD in planning stage, such as settling waste containers suitable to the amount of solid waste, or zoning the solid waste collection according to the waste quantity and collection ability. Because of GIS advantages: the ability in providing update and valuable information, saving time and decreasing work, PCD has to use the system to service people speedily.

6. Increasing staff's efficiency. PCD has promoted and developed the staff's efficiency according to the policy "Staff has to be Developed First, and then Work will be Effective." Thus, staff is trained by holding seminars or field trips so that knowledge and understanding can be increased.

7. Using techno graph. Techno graph or speed motor recorder is new equipment that PCD uses to control the driving behavior of waste truck drivers, as well as to protect the accident. The data from techno graph about speed, distance and time of driving can be analyzed and is useful in the planning stage.

8. Setting up a regulation. Since PCD realized the important role of regulation in an effective solid waste management, three bills were set up. The first Bangkok bill is about solid waste collection, transferring and elimination. The second is on solid waste collection; and the last is on staff and private sector compensation.

It can be concluded that the success of solid waste separation at source campaign hinges on the value of recycling. Thus, participation of the public in separating the solid waste before disposing is the important subject that PCD and other organizations try to promote. Furthermore, increasing the efficiency of solid waste collection and developing regulations are other solutions.

Awareness

Education Dictionary (2005) defines awareness as follows:

Awareness is the condition of being aware state of elementary or undifferentiated consciousness.

Based on the theory of gestalt, theme and thematic field, Marton and Booth (1997) recently advanced a theory concerning the structure of human awareness. They took the way of experiencing as the basic unit, analyzed it from a structural viewpoint, and suggested two constituting aspects of awareness (a) the delimitation of a theme from the context; and (b) the discernment of the parts that contribute to the theme.

The delimitation of a theme further suggests that certain elements or aspects of the context come into our focal awareness to constitute the theme (or figure) whilst other aspects recede into the background or form the backdrop (or ground) of a particular understanding.

Thus, in our experiencing of a phenomenon, there are always certain aspects of the phenomenon given to us simultaneously in our focal awareness. Marton and Booth used understanding Archimedes' principle as an example. What does it take to understand Archimedes' principle? They argue:

Being focally aware of the weight of a body immersed in some fluid as compared to its weight when not immersed, of the fact that a certain volume of the fluid is displaced by the act of immersion, of the weight of the fluid displaced all at the same time amounts to what it takes to discover, or to understand, Archimedes' principle.

It must then be noted that being aware of these aspects does not mean that we are not aware of other aspects of the situation, only that they have not been in focus and therefore become discerned. Furthermore, in no way does this preclude the possibility of another gestalt, way of

experiencing, or conception be formed with other aspects of phenomenon simultaneously occupying our focal awareness at other time.

But how can a certain aspect (or any aspect) of the phenomenon become one that occupies our focus and become discerned? Marton and Booth sought the answer in variation. They argue that without variability, many of the concepts that we employ would not have been there (e.g. gender would not be noticed if there were only one!). Quoting the work of Ueno (1990), he suggest that the difference between Newtonian and commonsense ways of thinking about motion lies in the former discerning motion as a dimension of variation whilst the latter taking objects-at-rest as the frame of reference. In short, discernment depends on variation.

In a phenomenography workshop in 1997, Marton summarized the new theory of awareness as addressing the relationship among discernment, simultaneity and variation. He suggested:

The qualitatively different ways of experiencing various phenomena can thus be understood in terms of the differences in discernment, simultaneity and variation at a deeper layer of the field of awareness connecting the person and the world.

One salient feature of this new theory of awareness is that it has provided a way for understanding the dynamic and contextual nature of conceptions, whilst maintaining a focus on the way of experiencing as a unit of study and hence an account of individual differences in learning.

Communication

Blythe (2001) defined communication as a transactional process between two or more parties whereby meaning is exchanged through the intentional use of symbols. Before sending the communication, the individual or firm must reduce the concepts to set symbols. Then this message can be passed to the recipient (encoded) and the recipient must decode the symbols to get the original message.

Hunt (1980) stated communication as a process of human interaction involves a creation of meaning to the listener. Since meaning can not be transferred, the sender attempts to create a meaning in the mind of listener similar to the meaning in his own mind. It is never possible to create the exact same meaning because no two humans are alike.

Devito (1991) said that communication always has some effect on one or more persons involved in the communication act. For every communication act, there is some consequence. For example, knowledge or the ability to analyze, synthesize or evaluate something can be gained.

Berlo (1960) presented the concept of communication as the process of transmitting messages from sources to receivers based on the SMCR model with its 4 basic elements: Source – Encoder (S), Message (M), Channel (C), and Receiver – Decoder (R) (Figure 1). In this shortened form of this model, source or encoder encodes a message and places it in a channel and a receiver or decoder can decode it. The factors that determine the effectiveness of the communication are:

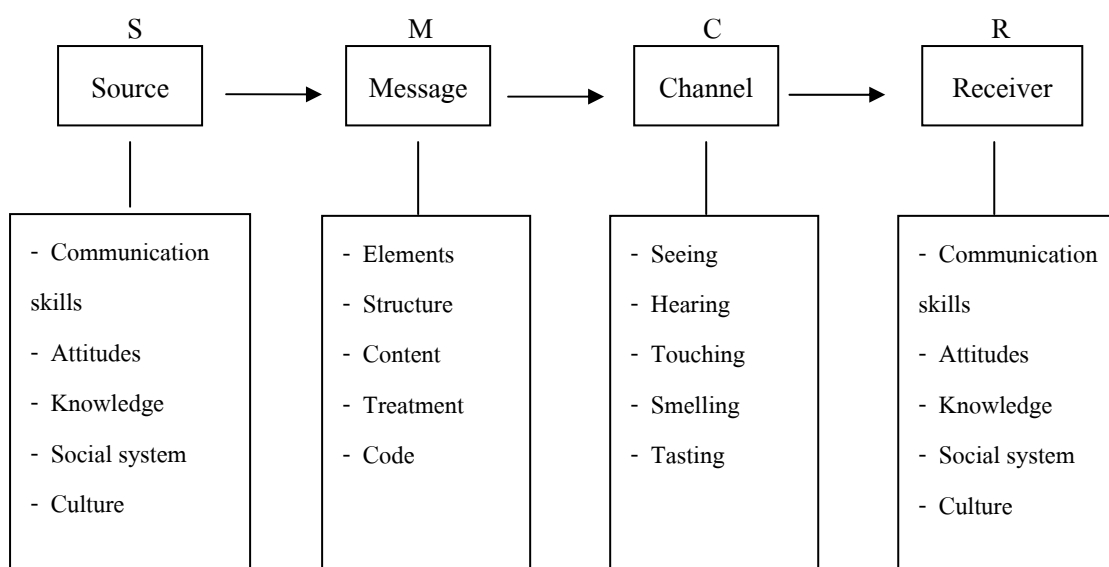


Figure 1 Berlo's Model of Communication

This is a model that emphasized the transmission of information, ideas, attitudes or emotion from one person or group to another person or group of people. The SMCR model

stresses the importance of a systematic perception of human behavior as a prerequisite to communication analysis.

The Effects of Mass Media

Potter (1998) explains that there are five levels of mass media effects:

1. Cognitive media can immediately plant ideas and information into our minds.
2. Attitudinal the media can create and shape our opinion, beliefs and values. They can reinforce and change attitude.
3. Emotional the media can make us feel things. They can trigger strong emotions and also weaker emotion. Emotional reactions are related to physiological changes.
4. Physiological media can influence our automatic bodily systems, which are usually beyond our conscious control. For example, listening to peaceful music can calm and relax us by reducing our heart rate and bringing our breathing down to a regular, slow rate.
5. Behavioral media can trigger actions. Imitation, activation and habit formation is behavioral change by media. Therefore, mass media can influence behaviors not just in a specific action, but in a general, long-term manner.

Media Exposure

Information is one of the most important factors used in decision making in many activities of people. The demand for information increases when the individual wants details in making decision or is not sure of something. They will not receive all the information that come through them but will choose only some parts that they think are beneficial to them.

In receiving information from the media human exposure can be separate into 4 groups (McCombs and Becker, 1979):

1. Surveillance is following the movement and noticing events from the media in order to be updated and knowing what is important.
2. Making decision concerning daily living. Receiving information makes the individual able to set their views toward the situation surrounding them.
3. Discussion is when receiving information from the mass media helps individuals know about the information and the ability to bring the information into conversation with others.
4. Participation is to be aware and participate in daily events that occur in society and things surrounding us.

For receiving information through selective process, it has 4 steps as follows (Klapper, 1960):

Selective exposure

Individuals will choose media and information from many sources depending on their interests and needs in order to bring into use to solve the problems and information to satisfy their own needs.

Selective attention

Besides receiving information, individuals tend to put their interests towards the information that relates with attitudes and beliefs of their own, while sometimes try to avoid information that goes against their attitudes and belief. This is because when the information goes against their feelings, it will cause them to feel unsatisfied and confused.

Selective perception and Selective interpretation

When individuals receive information from whatever source, they might choose to perceive and choose to interpret what was received according to their experiences. They will interpret the information in which they understand or according to their attitudes, experience, beliefs, needs and their own motives.

Selective retention

After the audience choose their interests, choose to be aware of and interpret information that goes along with their attitudes and beliefs, they still choose to remember the information needed to store as experience while at the same time, they tend to forget information that does not go along their interests.

Moreover, Schramm (1954) also noted other elements, which affect selective exposure. These are as follows:

1. Audience with different experiences will look for different information.
2. Audience will track information to fulfill the objects.
3. Audience with dissimilar backgrounds will care for unrelated details.
4. Education and environment have effects on the selection of the media type as well as the subject matter.
5. Ability to gain information also depends on physical and mental state of the audience.
6. Personality has an impact on the change of attitude, persuasion and behavior of the audience.

7. Emotion and mental condition may be an obstacle to understand the meaning of the message.

8. Attitude defines the way to get and react with the received information.

Kasetsart University (Bangkhen Campus)

Kasetsart University (Bangkhen Campus) is located 50 Phahonyothin Road, Lat Yao Subdistrict, Chatujak District, Bangkok 10900 near Phahonyothin Road Kilometer 14 at the intersection of Phahonyothin and Ngamwongwan Roads (Kasetsart University, 2005).

Vision

Kasetsart University is a university known internationally for academic excellence and work of world standard. It is a prime mover in mustering intellectual resources to help the nation achieve sustainable development and negotiating power in the world community.

Task

Kasetsart University gathers wisdom and knowledge, creates and develops varied bodies of knowledge, and form people who are intelligent, who think rationally, who behave morally, who are conscious of the common good, and who produce high standard work capable of competing in the world market. The university manages its resources efficiently, joins in the development of the community, and is responsible to society so as to serve as an important instrument in ensuring the well being and security of the country.

Philosophy

Kasetsart University devotes itself to the task of accumulating and developing intellectual knowledge. It thrives for the growth in academic wisdom including ethical and moral excellence.

In addition, it has a responsibility to play a leading role in keeping our Thai heritage alive and to ensure that it continues to grow to enrich the civilization of the nation.

Faculty

Kasetsart University (Bangkhen Campus) has all together 13 faculties including Faculty of Agriculture, Faculty of Business Administration, Faculty of Fisheries, Faculty of Humanities, Faculty of Forestry, Faculty of Science, Faculty of Engineering, Faculty of Education, Faculty of Economics, Faculty of Architecture, Faculty of Social Science, Faculty of Veterinary Medicine and Faculty of Agro-Industry.

As Kasetsart University is confronted with waste volume increasing problem, it tried to solve this problem by setting many projects for reducing waste volume increasing e.g. setting the project named "Collecting waste via Full Circuit Period 1" under the responsibility of the Gardening and Cleaning Sub Division (Kasetsart University, 2005) for encouraging the Kasetsart University staff and students to take part in waste separation. In the future, this project could help reducing waste volume through active participation of Kasetsart University staff.

Vehicle, Building and Physical Plant Division

It was established in 1971 by the Office of the President with the first name of "General Service Unit" its duties included vehicle service, public utility and building. Afterwards it is 1 of 7 division separations and has 8 main jobs: general affairs, take care of all buildings and surrounding, maintenance job, vehicle affairs, take care of all gardens and cleaning job, security job, take care of Jakpanpensiri Building and take care of 50 years Information Building (Vehicle, Building and Physical Plant Division, 2005).

The Gardening and Cleaning Sub Division is under the Vehicle, Building and Physical Plant Division of Kasetsart University. This organization looks after waste separation, waste separation management, gardening and cleaning in Kasetsart University. In 2002, the Gardening and Cleaning Sub Division had only one truck to collect the waste around daily and the year after

that they increased to 2 trucks, and collected the waste twice daily, once in the morning and once in the afternoon.

During the year 2002-2004 the disposed waste in Kasetsart University averaged 6.11 tons per day (Vehicle, Building and Physical Plant Division, 2005). The key factor that affects the volume of waste is collecting period. This means during the end of each semester, April and October, the volume of waste is less than the other months because the students in each faculty are less than during the semester time (Table 1).

Table 1 The volume of waste collected in Kasetsart University from 2002-2004

(Unit: Kilograms)

Month	2002		2003		2004	
	Quantity	Average/day	Quantity	Average/day	Quantity	Average/day
January	127,220	5,088.80	162,760	6,260.00	158,580	6,607.50
February	112,340	4,884.34	141,151	5,881.28	152,980	6,119.20
March	116,850	4,674.00	77,070	5,928.46	134,020	5,360.80
April	80,560	5,035.00	99,450	5,525.00	116,090	5,528.00
May	121,770	5,294.34	163,090	6,272.69	149,560	5,982.40
June	133,960	5,824.34	197,440	7,897.60	204,810	8,192.40
July	94,610	5,565.29	197,040	7,578.46	182,990	6,777.41
August	135,640	5,897.39	176,830	7,073.20	161,400	6,456.00
September	140,550	5,856.25	190,630	7,331.92	151,940	6,606.00
October	99,200	5,221.05	133,720	5,813.90	144,880	5,795.20
November	154,930	6,197.20	172,700	6,908.00	171,040	7,126.60
December	124,530	5,660.45	154,280	6,428.33	162,520	6,771.60
Total	1,442,160		1,866,161		1,890,810	

Source: Vehicle, Building and Physical Plant Division (2005)

In 2004, the Vehicle, Building and Physical Plant Division set the project named "Collecting waste via Full Circuit Period 1" under the responsibility of the Gardening and Cleaning Sub Division for encouraging the Kasetsart University staff and students to take part in waste separation (Vehicle, Building and Physical Plant Division, 2005).

The process of "Collecting waste via Full Circuit Period1"

1. Send the circular letter to the faculties, institutes and departments about selling the recycle waste to the Gardening and Cleaning Sub Division.
2. Determine the exact date for buying the recycle waste.
3. Weigh the recycle waste.
4. Separate the waste again.
5. Contact with boiling paper factory directly for selling paper.
6. Contact with middleman for collecting the recycle waste.
7. Transfer the money to the faculties, institutes or departments every month.

For this project, the faculties, institutes and departments of Kasetsart University would be able to dispose waste properly. They can sell the recycle waste to the Gardening and Cleaning Sub Division for transforming into other products and they can get extra income from the recycle waste.

Related Research

Manisri (2002) conducted a study on “Media Exposure and Practice of Dwellers in Samakki Thewasoonthorn Crowded Community towards Solid Waste Separation at Source Campaign”. The results revealed that most of the dwellers were below 20 years of age and were business owners or freelancers. Their education was up to primary school. The dwellers were exposed to the solid waste separation at source through personal media at a low level; however through mass media: posters or boards and television they were exposed at a medium level. Most of dwellers separated garbage at a high level, separated rubbish at a high-medium level and separated hazardous waste at medium - low level. The dwellers with difference demographics (gender, age, education and occupation) had a significant difference in media exposure (personal media and mass media) towards solid waste separation at source campaign. The dwellers with different gender and education had a significant difference in the practice of the solid waste separation at source. And media exposure of dwellers towards the solid waste separation at source campaign through district officers, community leaders or community committees, television, radio, posters or boards and others media correlated positively to the practice in the solid waste separation at source.

Jearsakul (1993) conducted a study on “Behavior in Solid Waste Management of Residents in the Middle Area of Bangkok Metropolis”. The results stated that most of the respondents discarded solid waste to the storage containers without separation. The minority separated recycles waste for resale value at the buy back centers. The respondents, who had high education level and high income, lived in a house, worked in a government sector and knew the situation of solid waste problem in Bangkok Metropolis would have the correct behavior in solid waste management more than others. However, knowledge in solid waste management and its regulation did not affect the behavior in solid waste management. Thus, knowledge was not a factor to change human behavior; it should have other supporting provision such as trash bins.

Prakobpon (2000) conducted a study on “Knowledge and Decision Making with Solid Waste of Mathayomsuksa Six Students in Phetchaburi Municipality”. The results of the study revealed that most of the sample group knew a lot about types of solid disposal, problems and

danger from solid disposal, getting rid of and dealing with solid disposal, and use of solid disposal. In regard to the hypothesis in term of knowledge, it is found that sex, homeland, parents' income, learning program and the frequency of receiving information do not have any statistical relation. In term of decision making, it is found that most of the sample group can make a decision well about separating solid waste disposal, use of solid disposal, participating in solid disposal project. As for the test of hypothesis, it is found that knowledge related to decision making about solid disposal management at statistical significance of 0.05 and the frequency of receiving news from radio and television related to decision making in the opposite way. Newspaper, personals media, sex, learning, homeland and parents' income don't have any relation to statistics.

Sudsai (2001) conducted a study on "Knowledge in Solid Waste Management of Members of Sub district Administration Organization Council in Amphoe Muang Changwat Phetchaburi". The result of this research showed that 89.3 percent of the samples actually had knowledge in solid waste management. The variables of age and level of education showed a 0.05 statistical significance of relationship with knowledge of solid waste management. The variables of sex, career, information perception and experience showed a 0.05 statistical significance of relationship with knowledge of solid waste management. There were important problems and obstructions in solid waste management such as they didn't have budget for waste collection and disposal. People lack knowledge on waste management. They lack of cooperation in waste management are additional problem. There were also some interesting suggestions from this research such as improving campaigns for educating the local people about waste management problems in their districts.

Hunsasiripoj, et all (1998) conducted a study on "The Bangkokians' Opinion and Participation towards Waste Disposal and Clean Keeping". The results of the study stated that most of the Bangkokians did not separate waste before disposal. Forty-five percent of the respondents had knowledge about hazardous waste at low level, so they disposed used batteries, bulbs or chemical substance mingling with other wastes. Since most of the Bangkokians did not have discipline in waste disposal in the public area, they littered solid waste on roads. Females were aware more about cleanliness than males. The samples that had high income with bachelor

degree and above had positive opinion towards waste disposal and cleanliness. Therefore, gender, age, education level, career, characteristics of residence and workplace, location of residence and media exposure were related to opinion towards waste disposal and cleanliness. In terms of participation, education level did not relate to the participation in waste disposal and clean keeping while income, education level, career, media exposure and good relation with waste collectors were factors relating to the participation.

Laddachayaporn, et al (1998) conducted a study on “Solid Waste Management Communities in Chiang Mai”. This study aimed at the effectiveness of garbage behavior of the people in Amphur Muang, Chiangmai province. Their knowledge, opinion and garbage separating behavior before and after the campaign were recorded and compared. In addition, the content of garbage was investigated as well. The study revealed that female was more responsible for garbage management than male. Their age were ranged between 26-45 years olds. They were mostly educated at the secondary school level. Their family size was between 1-3 members. They were traders more than other professions. Mostly, their homes built in a small area. After the campaign there was an increment of 21.6% in the sampled population who received the message of garbage separation. The increment of 30.50% and 3.58% of them gained more knowledge about wet and dry garbage separating, respectively. Eighty seven percent of the sampled population was aware about the benefit of garbage separating. Before the campaign 87.10% of them thought that they were affected from the surplus garbage. The effects could be identified into 2 ways: 89.47% of them thought that surplus garbage affected their health and mental hygiene and positive opinion about garbage separating. In practice, 41.60% of them bought plastic garbage bags to the dealer come to buy at their houses. However, after the campaign there was no change of garbage separating behavior, separating between wet and dry garbage, before disposing to municipal garbage tank. The campaign did not have an effect on the characteristics and content of garbage. More than 70% of the garbage was still wet garbage in both wet garbage and dry garbage tank.

Piriyant (1997) studied on “Media Exposure, Knowledge and Attitude of the People Affecting the Waste Sorting in a Pilot Project Area”. The results indicated that the respondents who differed in education background, occupation, income and characteristics of residence

differed in media exposure. Exposure through friends or colleagues increased the knowledge in the waste sorting. Otherwise, the knowledge did not affect to the attitude in the waste sorting. The respondents had more positive attitude and higher participation to waste sorting if they were more exposed to newspaper, cleaning officers and exhibition. People who resided in commercial buildings, dormitories, or condominium had negative attitude in waste sorting.

Eksuwan (2002) conducted a study on “Factors Affecting Solid Waste Management Knowledge of Sub district Administrative Organization Committee in Suratthani Province”. The result revealed that members of sub district administrative organization committee were mostly men with the age in the range of 35-45 years old. Their education level was Mathayomsuksa. Average household income ranged from 5,000 to 9,999 baht. Level of information receiving concerning in solid waste management was low. Furthermore, the knowledge about solid waste management of most sub district administrative organization committee was medium level.

Chatchawan (2000) conducted a study on “Household Waste: Present Methods and Concepts for Management-Problem Solving”. This research presented methods and concepts for household waste management-problem solving in Chiang Mai and Lampoon Province. The results indicate that the largest fraction of solid waste in both urban and rural areas was plastic bag. Although most people were aware of the solid waste impact to the environment and its problem, especially plastic products, they still used them increasingly. In fact, people agreed that waste reduction was a good idea. In daily life they separated only recyclable solid waste such as newspapers, metal scraps or glass, etc. for selling, but garbage and hazardous waste were mixed together. However, people would be ready to separate solid waste by types if serious campaigns or the facilities in waste separation were provided. In many areas there were not enough solid waste containers or collection service to the area; therefore, people themselves managed solid waste by burning near their house. Besides the solid waste in Chiang Mai and Lampoon Province, most of wastewater (including excreta and toilet waste) was collected in septic tanks. Gray water from washing or cleaning was disposed on the surface of land around their houses directly and it created smell in the neighborhood.

Chansunthorn (2002) conducted a study on “Behavior and Opinion towards Littering and Solid Waste Separation in Uttaradit Municipality Changwat Uttaradit”. The results of the study showed that most of the sample groups were female and 42.4 years old on average. The number of household members was 4.2. They were Buddhists with primary school education. Their occupations were private owned business or commercial with average income of 6,114.2 baht per month. The main sources of the household waste were from cooking and eating. Most of households had 2 plastic bins. Wastes were disposed without separation and picked up by municipality services. Glasses, bottles, paper and metals were separated for sale. Left food waste put into plastic bags with other wastes. Foam, plastics, and plastic bags were disposing with other wastes such as fluorescent lamp, dried-cell batteries, clothes, leather and rubber. Information source regarding solid waste separation knowledge was television. The Multiple Classification Analysis (MCA) showed that the differences of people’s opinion on solid waste separation practices were based on management and littering behaviors. Learning about solid waste separation through different media was found that no effect on people’s opinion about solid waste separation practices.

Chiewvech (2004) conducted a study on “Attitude of Municipal Commission towards Waste Disposal Method in Municipalities of Changwat Suphan Buri”. Study results indicated that members of the municipal commissions in Changwat Suphan Buri were mostly male, graduated with a high school certificate or vocational certificate, with an average age of 48. Their major occupations were traders or private businesses, with an average monthly household income of 54,394.44 baht. The population under study had high levels of understanding and attitude towards waste disposal method of the pilot project in their municipalities. The hypotheses testing revealed significant differences of both understanding and attitude among members of the municipal commissions with different number of terms in office, status within the commission, and level of education attainment. Moreover, their opinion regarding the municipalities’ waste disposal method highly correlated to their attitude toward waste disposal method of the pilot project. It is thus suggested that the waste disposal method of the pilot project should be disseminated more widely to every municipality’s commission. For instance demonstration of waste disposal in each and every municipality should be staged; a study tour of the pilot projects at Tambon Laem Phak Bia, Changwat Phetchaburi for the commission should also be undertaken. Such activities should

enhance the commission's attitude towards the pilot project and would enable them to apply the pilot project in their own municipality.

Conceptual Framework

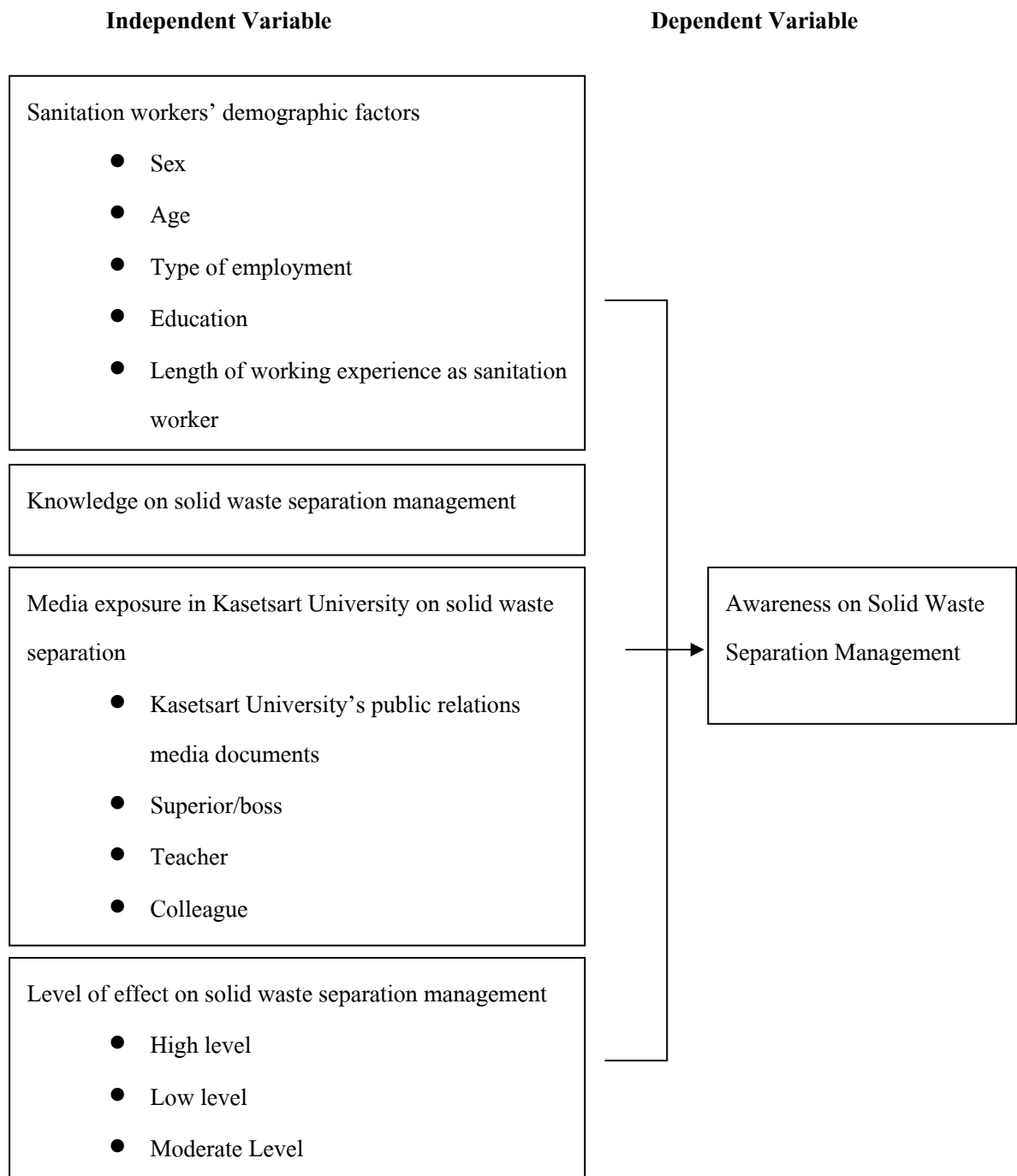


Figure 2 Conceptual Framework

Hypotheses

This research tested the relationship between independent variables and dependent variable as follows:

1. Relationship between demographics of the Kasetsart University sanitation workers and awareness on solid waste separation management
 - 1.1 Relationship between sex and awareness on solid waste separation management
 - 1.2 Relationship between age and awareness on solid waste separation management
 - 1.3 Relationship between type of employment and awareness on solid waste separation management
 - 1.4 Relationship between education and awareness on solid waste separation management
 - 1.5 Relationship between length of working experience and awareness on solid waste separation management

2. Relationship between level of knowledge of the Kasetsart University sanitation workers and awareness on solid waste separation management

3. Relationship between Kasetsart University media exposure of the Kasetsart University sanitation workers and awareness on solid waste separation management
 - 3.1 Relationship between media exposure and awareness on solid waste separation
 - 3.2 Relationship between Kasetsart University's public relations media documents exposure and awareness on solid waste separation management
 - 3.3 Relationship between superior/boss exposure and awareness on solid waste separation management
 - 3.4 Relationship between teacher exposure and awareness on solid waste separation management
 - 3.5 Relationship between colleague exposure and awareness on solid waste separation management

3.6 Relationship between level of effect of Kasetsart University media exposure on solid waste separation behavior and awareness on solid waste separation management

3.7 Relationship between level of effect of Kasetsart University's public relation media documents and awareness on solid waste separation management

3.8 Relationship between level of effect of superior/boss exposure and awareness on solid waste separation management

3.9 Relationship between level of effect of teacher exposure and awareness on solid waste separation management

3.10 Relationship between level of effect of colleague exposure and awareness on solid waste separation management