THE EFFECTS OF LOCAL CULTURAL AND SOCIO-ECONOMIC FEATURES ON THE STRUCTURE OF SOLID WASTE MANAGEMENT IN DEVELOPING COUNTRIES: THE CASE OF THE PHILIPPINES AND VIETNAM

Phares P. Parayno[1] and N.D. Trang[2]

Abstract

This paper investigates the effects of local socio-economic factors on the adoption of various waste management technologies in the Philippines and Vietnam. Three sets of factors have been selected. The first set of factors includes the economic situation of the community: income, unemployment, and the housing density. The second set of factors includes the availability of fees for waste management services, the nature of leadership, and the application of the technology in other Asian countries. The third set of factors includes several perceptions on the waste technology such as its appropriateness to the community, its usefulness in improving waste management, potential dangers of the technology, and trust in the technology. Respondents from the Philippines come from the local government units, government agencies, corporate sector and the academe. The Vietnamese respondents are students and lecturers who are involved in activities related to solid waste management.

While perceptions of respondents from both countries on income, unemployment, and dwelling situation vary, there appear similarities in the preferences in the kind of waste management technologies in the two countries. Generally in both countries, community members pay for waste services and are willing to pay some contribution for a better waste management. There is a general perception that leadership is essential in the adoption of advanced solid waste management technologies and a strong trust on advanced technologies such as used in European countries to improve solid waste management in the two countries. Adoption of these technologies would be facilitated by examples of applications of such technologies in other Asian countries. In both countries there seems to be optimism that segregation of wastes at source into very specific fractions is a feasible option in their community.

1. Introduction

Solid waste management is a major responsibility of local governments. It is a difficult task because it depends upon organization and cooperation between households, communities, private enterprises, and municipal authorities. It is also dependent upon the selection and application of appropriate technical solutions for waste collection, transfer, recycling and disposal. Waste management has important consequences for public health and well-being, and the quality and sustainability of the urban environment. Unfortunately, waste management services in many developing countries are inadequate; a large part of the population does not have access to a waste collection service and only a small fraction of the generated waste is actually collected.

Appropriate waste management solutions vary from one locality to another. Establishment of a materials recovery facility may be the more acceptable solution in one community where sanitary landfill is perceived as inappropriate. This paper investigates the effects of local

[1] Environmental Programs, Graduate School, Miriam College, Katipunan Road, Diliman, Quezon City, Philippines. Email: pparayno@mc.edu.ph

[2] Faculty of Chemistry, Hanoi University of Science, Hanoi, Vietnam.

cultural and socio-economic factors on the adoption of various waste management technologies in the Philippines and Vietnam. What factors appear to be significant in determining the adoption of a particular waste management technology in an area? Do the same factors lead to the selection by different communities of similar technologies?

The study uses data from the Philippines and Vietnam to asses the effects of these factors on the structure of solid waste management. The data are obtained through a survey using a questionnaire that comprises the following major information: (a) details of respondents; (b) perceptions on community data; (c) payment for waste services; and (d) perceptions on future waste management and various technological options for solid waste management. Respondents from the Philippines come from the local government units, government agencies, corporate sector and the academe. The Vietnamese respondents are students and lecturers who are involved in activities related to solid waste management.

2. Waste Management in the Philippines and Vietnam

2.1 Waste Management in the Philippines

Solid waste is one of the most pressing environmental problems in the Philippines. Generation of solid waste in the Philippines is more than 10,000 tons per day. Per capita wastes produced are estimated to be from 0.30 to 0.70 kg/day, depending on whether the estimate refers to selected residential areas or all sources of wastes. Average efficiency of collection is only about 40%; and the most common disposal system is open dumping and burning.

Open dumping is the most common disposal method for solid wastes in Metro Manila. A garbage crisis took place in Metro Manila when the two "landfills" in San Mateo and Carmona were closed in 2000 and 1998 respectively, and Payatas dumpsite was partially closed. These disposal sites handled 32% and 35% of Metro Manila wastes, respectively. The Payatas open dumpsite handled 30% of wastes. The dumpsite was temporarily closed on August 2000 right after the tragedy, where a number of residents perished from a landslide caused by heavy rains. It has then reopened in order to accommodate limited sources of wastes, mainly from Quezon City, where it is located (MMDA/JICA 1998).

To respond to the increasing waste problems, local government units had intensified their efforts to make collection more efficient. Some have started to shift to a more sanitary disposal system (sanitary landfills). While these are moves in the right direction and are necessary components of any effort to solve the problem, by themselves, they are not enough. On January 26, 2001, President Gloria Macapagal-Arroyo signed the Ecological Solid Waste Management Law or Republic Act 9003. This Law specifically sets guidelines for solid waste avoidance and volume reduction through reduction at source and waste minimization measures that include composting, recycling, re-use before collection, treatment, and disposal in appropriate solid waste management facilities.

The law has these important provisions:

a. mandatory solid waste diversion rate of 25% within the next five years at the local level. This will require each local government unit (LGU) in the next five years to divert annually, on the average, 5% of its solid wastes away from waste disposal facilities into resource recovery activities such as reusing, recycling, and composting.

b. mandatory segregation of solid wastes at source to include household, institutional, industrial, commercial, and agricultural sources. The wastes will be segregated and properly marked as can-be-composted, non-recyclable, recyclable or special wastes. Segregation and collection of biodegradable, can-be-composted and reusable wastes shall be conducted at the barangay level, while collection of non-recyclable materials and special wastes shall be the responsibility of the municipality or city.

c. establishment of recycling and composting programs, including an inventory of existing markets for recyclable and can-be-composted materials, the establishment of materials recovery facilities at the local level and setting up of drop-off locations for recyclable materials.

d. LGUs have the authority to collect solid waste management fees. The LGUs can impose fees sufficient to pay the costs of preparing, adopting, and implementing a solid waste management plan.

2.2 Waste Management in Vietnam

The generation of solid wastes in Vietnam has been increasing steadily over the last decade. The average amount of waste produced per year was 5.9 million tons/yr (Nguyen 2005) in 1996, which rose to 12.8 million tons per year eight years later (Vietnam Environmental Monitor 2004). Those numbers are predicted to increase by over 60 percent before 2010 (VEM 2004).

Presently, the amount of domestic solid waste produced by each person on a daily basis is relatively low compared to other cities in the region. This per capita waste is expected to increase in 10 to 15 years to 1.2 per capita/day, a rate which will put Vietnam on par with other large Asian cities. Although urban residents make up only one-quarter of the population, they produce half of the solid waste. Data show that the average city resident produces over two-thirds of a kg of waste daily, which is twice as high as rural residents.

Solid waste management falls under the jurisdiction of several governmental bodies at the national, provincial, and municipal levels, although there is no unified or standardized system of waste collection. Thus, waste collection rates and efficiency vary from one locale to the next depending on two factors: proximity to the urban center as well as the size of the city. In many cities, the Urban Environment Company (URENCO)—contracted out by the local People's Committee—collects, transports, and disposes of domestic waste and, in most cases, industrial and healthcare wastes as well.

Waste collection rates were low even though they have been improving; from 2000 to 2003, the average collection rate for cities across the country increased from 65 to 71% (VEM 2004). There is still a great deal of disparity from one city to the next; for example, the percentage of waste collected in the city of Long An was 45% while in Hue, it was 75% (VEM 2004). On average, cities with population size greater than 500,000 had collection rates of 76% while it was only 70% for cities whose size was between 100,000 and 350,000 (VEM 2004). As a result, the method of self disposing of waste into nearby rivers, lakes and at sites near home, or burning, or burying the trash is widespread. In contrast to the urban collection rates, rates in the rural areas were dismally low. In high-income rural areas, the amount of trash collected was a mere 20%, indicating that collection services for low-income rural population were practically non-existent.

Almost all municipal waste is taken to landfills. There are 91 landfills located throughout Vietnam but only 17 are sanitary landfills (VEM 2004). Open and controlled dumps are the predominant form of waste disposal facility. Of 61 provincial capitals, only 12 have engineered and sanitary landfills (VEM 2004). Most of them do not have the necessary ground linings or adequate top covers; many of them are located within 200 – 500 meters of residential areas (Nguyen 2004). Many landfills and dumps are poorly operated, posing an enormous health threat to local populations due to ground and surface water contamination from untreated leachate.

Rates of recovery and recycling in Vietnam are high. No information is available on the amount of waste recycled annually at the national level although it is known that in Hanoi, approximately one fifth of municipal waste is recycled, which is higher than many Asian cities. In general, recycling practices at the household level are quite high due to the fact that many families will give away used items or sell them back to used/repair shops. (Nguyen, 2005)

3. Methods

3.1 Conceptual Framework

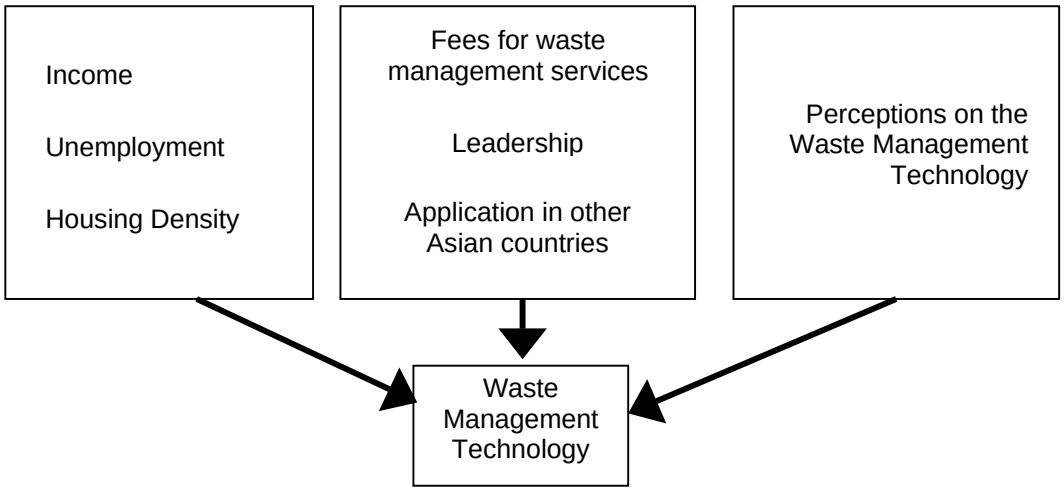

Figure 1. Influence of various factors on adoption of waste management technology.

Several factors could influence the adoption of a waste management technology. The first set of factors includes the economic situation of the community: income, unemployment, and the housing density. The second set of factors include: the availability of fees for waste management services; the nature of leadership; and the application of the technology in other Asian countries. The third set of factors include several perceptions on the waste technology such as its appropriateness to the community, its usefulness in improving waste management, potential dangers of the technology, and trust in the technology.

3.2 Data Collection

A survey questionnaire is formulated to facilitate gathering of relevant data. The survey questionnaire consists of the following elements: (1) respondent details; (2) community information; (3) waste management information; and (4) perceptions on future waste management (see table 1).

Table 1: Elements of the questionnaire.

Respondent Details	• Type of organization involved with • Position in the organization • Involvement in solid waste management issues • Years in the organization
Community information	• Income situation in the community • Unemployment situation in the community • Dwelling situation in the community
Waste management information	• Payment for waste services • Amount paid for waste services
Perceptions on future waste management	• Willingness to pay for better waste management • Importance of leadership in the uptake of advanced solid waste management technologies • Effect of adoption of advanced waste management technologies in other countries to improve solid waste management in your country. • Effect of application of such technologies in other Asian countries in their adoption in your country. • Feasibility of segregation of waste at source into specific fractions

The last portion of the questionnaire comprises the influence of several perceptions on the likelihood of adoption of the four waste management technologies in the community. Respondents were asked to rate, from 1 for very low to 5 for very high, the effects of these factors on the technologies that include: (1) centralized (larger scale) composting facility; (2) organic digester; (3) materials recovery facility; and (4) sanitary landfill. The following factors were considered:

- general acceptance;
- NIMBY (Not In My Backyard) syndrome ;
- perception as of not being appropriate;
- perception as of being too expensive in comparison to alternative solutions;
- chance to avail of alternatives;
- problem in finding the appropriate areas;
- fears with regard to possible nuisances/dangers;
- trust in the technology; and
- perception as to the usefulness of waste management technology options to help improve waste management and to provide useful outputs.

There are 27 respondents from the Philippines who come from the government, private sectors and the academe. Sixteen respondents come from the local government units, six come from government agencies, three come from the corporate sector, and two from the academe. They are involved mainly in planning activities with respect to solid waste management. They have been working in their respective organizations for only less than 10 years, but two respondents have been with their organizations for at least 30 years.

Respondents from Vietnam are mainly university lecturers and students. Most of them are involved in activities related to solid waste management. They belong to a group that has earned higher academic training. There are 11 university lecturers, 10 university students and others coming from different organizations such as Faculty of Chemistry, Vietnam Productivity Centre, and Hanoi University of Construction.

4. Results and Discussion

4.1 Community Data

The following results are based on the perception of the respondents. On the income situation of the community in the Philippines, about 44 percent of the respondents think their communities have income that is below general average, 30 percent consider their income medium, while 26 percent perceive their community to have an average income. The results in Vietnam show a different trend. Most of the respondents (88.5 percent) perceive their communities to have average income, while only 11.5 percent consider their communities to have above average income. No one considered its community to have below average income.

In the Philippines, about 61.5 percent of the respondents think that the extent of unemployment problem in their community is small. Only 11.5 percent think that the extent of unemployment in their community is high. In Vietnam, about 54 percent of the respondents consider the unemployment situation in their community to be a medium scale problem. Nineteen (19) percent of respondents think the unemployment problem in their community is high, while 27 percent think that it is only a small problem.

Table 2: Perception of income situation in the community (percent)

	Below Average	Average	Above Average
Philippines	44.0	30.0	26.0
Vietnam	0	88.5	11.5

Table 3: Perception of unemployment problem in the community (percent)

	Small	Medium	High
Philippines	61.5	27.0	11.5
Vietnam	26.9	53.8	19.3

While a substantial portion of the respondents in the Philippines characterizes its community income to be below average, majority thinks that unemployment problem is small. Vietnam shows a different trend. Majority of respondents in Vietnam characterizes their community income to be average and considers the extent of unemployment problem to be on a medium scale.

Table 4: Perception of dwelling situation in the community (percent)

	Low Density	Medium	High
Philippines	64.0	16.0	20.0
Vietnam	11.5	46.2	42.3

On the perception of dwelling situation in the community, 64 percent of respondents in the Philippines classify their communities to have low housing density, while 20 percent think that housing density in their communities is high. In Vietnam, however, only 11.5 percent of the respondents characterize their community to have low housing density. Most Vietnamese consider their community to have either a medium housing density or high housing density.

4.2 Payment of waste management services

This part has two questions. The first one is about payment for waste services and the second focuses on the preference of respondents to improve waste services in their communities. In the Philippines, about half (52%) of the respondents indicate that members of their community are currently paying for waste services. Vietnam has a larger percentage of respondents (92.3 percent) that currently pay for waste services. Payment for these services in Hanoi City, namely collection, is 2,000 VND/person/month. Corresponding information from the Philippines was not indicated.

Interestingly, there is a similar trend in the Philippines and Vietnam when respondents were asked if they think community members would be willing to pay some contribution for a better waste management in their community. In the Philippines, 82 percent of respondents answered yes, while 80.8 percent of respondents in Vietnam answered yes. The maximum acceptable amount which they are willing to pay is 5,000VND/person/month. Whether respondents are currently paying or not paying for waste management services, there is that desire to improve waste management in their community for which they are willing to pay.

Table 5: Payment for waste management services (percent)

	Currently pay	Willing to pay for better services
Philippines	52.0	81.5
Vietnam	92.3	80.8

4.3 Adoption of advance solid waste management technologies

Both the Philippines and Vietnam think that leadership is essential in the uptake of advanced solid waste management technologies; 67 percent in the Philippines and 85 percent in Vietnam respectively. About 33 percent of respondents from the Philippines considered leadership to be important; while 15.4 percent of Vietnamese respondents had the same response. No one from both the Philippines and Vietnam think that leadership is not critically necessary in the adoption of advanced solid waste management technologies.

Table 6: Importance of leadership (percent)

	Philippines	Vietnam
Essential	66.7	84.6
Important	33.3	15.4
Good if present, but not critically necessary	0	0
Total	100.0	100.0

Respondents were then asked if they would trust the adoption of advanced waste management technologies such as used in Europeans to improve solid waste management in the country, 88 percent of respondents from the Philippines averred, while only 12 percent said they would not. It is to be noted that respondents just recently attended the seminar on waste management with presentations on technologies from Europe. Respondents are therefore expected to have a high appreciation of the potential of European waste management technologies to improve waste management in the Philippines. In Vietnam, 52 percent respondents would trust the adoption of advanced waste management technologies such as used in Europeans to improve solid waste management in the country, while 48 percent said they would not. The results could indicate the respondents' not-so-widespread understanding of waste management practices in Europe.

Furthermore, respondents (92 percent) think that examples of application of these technologies in other Asian countries would help in their adoption in the Philippines. Only 8 percent think otherwise. Similarly, in Vietnam, 96.2 percent of the respondents think that examples of applications of such technologies/experience in other Asian countries would help their adoption in Vietnam because the local waste management technologies did not satisfy their expectation of addressing solid waste management problems.

In the Philippines as well as Vietnam, most of the respondents (92.3 percent) indicate that segregation of waste at source into very specific fractions is a feasible option in their community. This result is expected since almost all of the respondents are directly or indirectly involved in solid waste management.

Table 7: Other relevant factors affecting future waste management in the Philippines and Vietnam (in percent).

	Philippines		Vietnam	
	Yes	No	Yes	No
Trust adoption of advanced waste management in Europe to improve solid waste management in the country	88.0	12.0	52.0	48.0
Examples of applications of such technologies in other Asian countries helpful in their adoption in your country	92.0	8.0	96.0	4.0
Segregation of waste at source into very specific fractions a feasible option in your community	92.3	7.7	92.3	7.7

4.4 Effects of local cultural factors on adoption of waste management technologies

The following discussion is based on Table 8, which contains the mean values of ratings of each item in the matrix. The results shown are applicable only to the Philippines. There are no sufficient responses from Vietnam. Results indicate general preference of a materials recovery facility (MRF) as a technological option for waste management over large scale composting, organic digester, and sanitary landfill. Organic digester is rated lowest among the four options. This choice seems validated by the next item on the NIMBY syndrome, where a high answer seems to indicate that the technological option is not acceptable in the community, while a low answer indicates that the option is acceptable in the community. In this case MRF is much more acceptable, while sanitary landfill the least acceptable.

Respondents perceive that sanitary landfill is the least appropriate option while large scale composting facility is the most appropriate option for their community. This may be explained by the respondents' perception that sanitary landfill is the most expensive option. MRF and organic digester are perceived the least expensive options. Another possible reason for inappropriateness of sanitary landfill in the community is its difficulty of finding appropriate areas. This, however, will not be a problem in the case of MRF where possible areas to locate MRF are easier to find because it does not require a large space compared with a sanitary landfill. Furthermore, respondents perceive that there are potential dangers and nuisance that could accompany the sanitary landfill option. This potential danger is perceived to be not that high in MRF. Finally, respondents trust the least sanitary landfill as waste management technology compared with the other technologies, with large scale composting facility being trusted the most. Large composting facility and MRF are perceived as more useful options to improve waste management in their communities than the other two options.

Table 8: Perception on the effect of local cultural factors on adoption of various waste management technologies in the community: the case of the Philippines (mean values of responses).

	Centralized (larger scale) composting	**Organic digester**	**MRF**	**Sanitary Landfill**
a. General Acceptance	3.19	2.30	**3.95**	2.93
b. NIMBY syndrome	2.15	2.04	1.86	**2.56**
c. Perception as not being appropriate	1.70	2.22	2.00	**2.41**
d. Perception as of being too expensive in comparison to alternative solutions	2.59	2.26	2.24	**2.93**
e. Chance to avail of alternatives	2.26	1.85	2.10	**2.67**
f. Problem of finding the appropriate areas	2.33	2.44	2.05	**3.63**
g. Fears with regard to possible nuisance / dangers	2.30	2.59	2.29	**3.11**
h. Trust in the technology	**3.00**	2.96	2.95	2.52
i. Perception as to the usefulness of these options to help improve waste management and to provide useful outputs.	3.26	2.85	**3.29**	2.89

5. Conclusion

While perceptions of respondents from both countries on the income, unemployment, and housing density in their communities vary, there appear similarities in the structure of solid waste management in the two countries. In both countries, community members, in general, pay for waste services and are willing to pay some contribution for a better waste management. Respondents from both countries consider leadership to be essential in the adoption of advanced solid waste management technologies. They trust the use of advanced technologies such as used in European countries to improve solid waste management in the two countries. Adoption of these technologies would be facilitated by examples of applications of such technologies in other Asian countries. In both countries there seems to be optimism that segregation of waste at source into very specific fractions is a feasible option in their community. This is expected from respondents whose are directly or indirectly involved in solid waste management programs in their respective communities.

The following claims are based on the evaluation made by respondents in the Philippines on several local cultural factors as they affect the adoption of four waste management technologies:

- There is a general preference of a materials recovery facility (MRF) as a technological option for waste management over large scale composting, organic digester, and sanitary landfill.
- MRF is a much more acceptable facility to be set up in the community, while sanitary landfill is the least acceptable option.
- Respondents perceive that large scale composting facility is the most appropriate option for their community while sanitary landfill is the least appropriate option.
- Possible reasons why sanitary landfill is perceived to be the least appropriate option include: (1) the difficulty of finding appropriate areas in the community to construct the landfill; (2) the respondents' fear of potential dangers and nuisance that could accompany the operation of the sanitary landfill; and (3) respondents' least trust on sanitary landfill as a waste management technology compared with the other technologies.

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