An Examination of the Poverty-Environment Hypothesis with Reference to Solid Waste Management of the Urban Poor in Malaysia

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Abstract: This study is an effort to examine the poverty-environment hypothesis with reference to solid waste management of the urban poor residing in squatters and low-cost flats of Kuala Lumpur, Malaysia. With the aim of examining this hypothesis, the study empirically assesses knowledge, attitude and behaviour of the urban poor concerning their household solid waste management. This study uses primary data collected from the level of living condition and waste management practices of the urban poor and then uses a multiplicity of statistical techniques such as t-tests of equality of means, one-way analysis of variance, chi-square 'likelihood ratio' tests and simple descriptive statistics. The findings of the study went against widely voiced assertion that poverty causes environmental degradation. The study, however, proposes that the problems of poverty and environment need to be seen differently as both the problems are experienced by different groups of communities in a different way.

Keywords: Poverty-Environment Hypothesis, Solid Waste Management, Urban Poor, Kuala Lumpur City

1   Introduction

The actual relationship between poverty and environmental degradation is still unclear. Since the 1970s, it has been almost universally agreed that poverty and environmental degradation are inextricably linked, and thus the alleviation of poverty has been identified as the major prerequisite of any effective environmental policy. The World Commission on Environment and Development (WCED, 1987) stated that 'Poverty is a major cause and effect of global environmental problems. It is therefore futile to attempt to deal with environmental problems without a broader perspective that encompasses the factors underlying world poverty and international inequality'. The linkages and interrelationships between poverty and environment were also seen to be self-enforcing. In this regard, the commission also stated that 'Many parts of the world are caught in a vicious downwards spiral: poor people are forced to overuse environmental resources to survive from day to day, and their impoverishment of their environment further impoverishes them, making their survival ever more difficult and uncertain'. In fact, the dominant viewpoint on poverty and environment reflects this image of a vicious downward spiral of need in the developing countries. Most of the environmental degradation in developing countries is gradual and almost invisible. It is generally accepted that environmental degradation, rapid population growth and stagnant production are closely linked with the fast spread of acute poverty in many countries of Asia (Jalal, 1993). The causes of urban environmental degradation lie largely at the management level (Hardoy et al., 1990).

However, the strong association between urban poverty and environment can also be explained in terms of waste management systems due to the fact that the urban poor usually live in underdeveloped areas where household waste collection and disposal services are believed to be non-existent. The squatters and low-cost flats can be worthwhile example of this type of underdeveloped areas. Because most of these areas are not well laid out, many of the dwellings are inaccessible so that even if the urban authorities wanted to establish waste collection services, most households could not be reached. Consequently, it is very likely to assume that most urban poor households dispose their household waste themselves around the immediate vicinity of their dwellings, and such environmental practices cause massive neighbourhood environmental degradation.

The problem of solid waste management is still perceived as an unresolved problem experienced by the developing countries. In Malaysia, this problem has been greatly resolved by the appropriate actions and policies taken by the government engaging both the government and private sectors. But the environmental problems related to solid waste management systems amongst the squatters and low-cost flat dwellers in Kuala Lumpur city are more acute, and thus they also require appropriate actions and policies to be taken by the respective authorities for resolving related environmental problems. This study is an effort to investigate the poverty-environment hypothesis with regards to solid waste management of the urban poor residing in squatters and low-cost flats of Kuala Lumpur because it is very often believed that the poor have a tendency to degrade the environment by practicing improper methods of environmental management systems.

2 Literature Review

There is still confusion over the link between poverty and environment. Some studies argued that poverty is the principal or only cause of environmental degradation, whereas findings of some other studies reveal that environmental degradation is the principal cause of poverty. Durning (1989) argued that a declining resource base directly contributes to further poverty, so the process continues in a 'downward spiral'. Ramphal (1992) stated that poor people often destroy their own environment not because they are ignorant but to survive, and they over-exploit thin soils, over-graze fragile grasslands and cut down dwindling forest stocks for firewood. In contrast, the findings of the study by Holmberg and Thompson (1991) contradicted this evidence, in which causality appears to run the other way. This study reveals that poor people often manage their environment in sophisticated and sustainable ways, and poverty can serve to limit their impact on the environment. It argued that increasing wealth can evidently lead to environmental degradation. Another study by Leach and Mearns (1995) concluded that poverty does not affect environment directly or environment is not the only cause of poverty and revealed that there are so many socioeconomic, political, demographic, management problems and conditioning variables, which affect the linkages between poverty and environment.

The literature on poverty-environment hypothesis in urban areas is surprisingly thin compared with the number of studies done in rural areas. The concrete empirical research on urban poverty and environment in Southeast Asia is very limited. Although few case studies on urban areas discuss particular progressing efforts, many suggest hypotheses to be explored further and usually require further investigation. In fact, all the aspects of the poverty-environment nexus in urban areas make the search for a single causal relationship that postulates either poverty causes environmental degradation or environmental degradation causes poverty. Following are the reviews of some empirical studies those were conducted for exploring this causal relationship between poverty and environment.

Prakash (1997) conducted a study in the state of Himachal Pradesh and the hill districts of Uttar Pradesh, India. Using both conceptual and empirical material, the study examined some of the major linkages that are believed to exist between the processes of poverty and environmental degradation. The study also examined whether the relationship between poverty and environment is functional or causal and assessed the role of other factors, particularly institutions and social and cultural influences. It revealed that environmental degradation is a negative externality whose causal roots, as well as solutions, lie in institutional and policy issues rather than in poverty itself and showed that poverty might have a lesser or more uncertain role in making environmental degradation. This is because the relationship between poverty and environment is mediated by institutional, socioeconomic and cultural factors, and the degradation in areas of endemic poverty is more often caused by the effects of the mismanagement of macro-economic, institutional and other policies and factors. The study suggested that given improved management of such factors, poor communities can and will have excellent reasons to

value the environment in both the short and long term. It also suggested that environmental degradation could be minimised in areas of widespread poverty if accurate assessments of micro and macro level causes for degradation are made. Besides this, appropriate institutional measures must be taken to allow poor communities to enhance their resilience in the face of economic and environmental shocks and risks.

Mueller (1993) conducted a study on the environmental degradation and urban poverty in Brazil. In this study, most of the urban poverty-related problems and environmental degradation have been explained as a result of uneven economic development. It revealed that congestion, inadequate sanitation, lack of freshwater supply, accumulation of household wastes, degradation of marginal lands together with the diseases and accidents are resulted from inadequate basic services, especially for those in the lower income brackets. The major deficiency found by the study in the poor urban settlements in Brazil is that of facilities for the disposal of human excreta, as the inadequate garbage removal services have caused major health and environmental problems. The study suggested that a considerable improvement in the urban environment and living conditions could be achieved with investments in basic services.

Omuta (1988) conducted a study in Sapele of Bendel State in Nigeria. The study examined the role of income levels on the links between poverty and urban environment. A total of 800 households were administered, and income levels were examined from neighbourhood to neighbourhood. The study revealed that the level of household income is a major factor in determining the quality of the urban environment and also revealed that the relationship between poverty and environment is both direct and strong, and thus, low-income households tend to live under very oppressive environmental condition with subsequent social and health problems. In order to avoid poverty-related environmental problems, however, the study suggested that the poor should be educated to appreciate quality rather than quantity and so should embrace the virtues of family planning as the ultimate key to urban environmental problems.

3   Research Method

The analysis of this study is based on primary data collected recently from three areas of squatter and low-cost flat in Kuala Lumpur. The squatters and low-cost flat households were chosen for the field survey. The overall sampling design for the study can be described as 'stratified quota random sampling' with the key stratification variable 'characteristics of household'. In the first stage, the household to be surveyed had been selected purposively through a preliminary 'windshield survey' in which the general characteristics of squatters or low-cost flat houses were found to exist. In order to do this, particular household types in each area were identified with the minimum interview-quota for each household type. Then, to interject randomness into the sampling plan, interviews were made with every second or third home on a particular street. A total of 300 household heads were interviewed from three parliamentary areas of Kuala Lumpur within which 100 households were selected from each area following the ratio of 60 and 40% for the squatters and low-cost flat dwellers, respectively. All interviews were conducted by trained enumerators guided by a well-structured questionnaire.

The parliamentary areas that were chosen are Kepong, Segambut and Titiwangsa, and the respective squatter areas that have been surveyed are Jinjang Utara Tambahan, Sentul Pasar and Datuk Keramat. Selection of these three areas for the study was based on the criteria that the poverty groups, which were observed to exist within the federal territory of Kuala Lumpur, are predominantly concentrated in the squatters and low-cost flats. Thus, to have the actual information on the poverty threshold, squatters and low-cost flat households were chosen as the potential respondents.

The study used descriptive statistics such as means, ranges and frequency distributions for selected variables that were created for use in multivariate analysis. The statistical significance of three types of differences between and among variables was determined by three types of tests. For example, the

significance of differences for continuous variables between pairs of means was examined by 't-tests of equality of means' and between more than two means such as differences among the three areas was examined by one-way analysis of variance tests. Besides, the significance of differences for discrete variables between and among observed and expected frequencies was examined by chi-square 'likelihood ratio' tests.

4   Results and Discussion

4.1   Householders' 'Knowledge' Regarding Solid Waste Management and Related Matters

4.1.1   Households' Waste Collection Services

Most of the respondents (96.7%) know that household waste collection services are provided in their living areas. The knowledge of respondents regarding waste collection services differs significantly among areas ($p < 0.10$), with the highest number of those who know about it was reported in Jinjang Utara (100.0%), followed by 96.0% in Datuk Keramat and 94.0% in Sentul. Virtually all the respondents in Jinjang Utara know that a private waste contractor provides such services in their areas. Respondents' views on waste collection agencies differ significantly among areas ($p < 0.01$). For example, the vast majority of respondents in Sentul (98.9%) know that local town authority provides waste collection services in their areas. But respondents' such views on the waste collection agency that is providing services in Sentul are not true, because both the squatters and low-cost flat houses in this area are serviced by a private waste collection agency. The reason behind not knowing about the actual waste collection agency in Sentul might be the lack of proper concern of respondents. Although the area of Datuk Keramat is serviced by a private waste contractor, only 60.0% of respondents of this area know this to be true. As many as 32.3% of Datuk Keramat respondents believe that local town authority provides their household waste collection services.

4.1.2   Frequency of Households' Waste Collection

Of all respondents interviewed, more than 44% report that household waste collection services are provided three times per week. The response 'every other day' was also considered equivalent with 'three times a week'. More than 15% of respondents report that waste pick-up is not according to schedule and 13.8% do not know about the frequency. Only 21.0% of respondents indicated that their household wastes are picking-up every day. In fact, the 'official' frequency of household waste pick-up in the three areas studied is 'three times per week', and it is conceivable that the actual frequency differs from this. The answers of the respondents in this respect differ significantly and reflect the respondents' lack of knowledge. The knowledge of respondents concerning frequency of waste collection differs significantly among areas ($p < 0.01$), with Datuk Keramat respondents being most well informed (58.3% 'correct' knowledge) and Jinjang Utara respondents being least well informed (36.0%). In Jinjang Utara, as many as 31.0% of respondents indicated that waste pick-up is not according to schedule. In Sentul, 54.3% of respondents indicated that wastes are picking-up everyday, which is the highest frequency of this view compared with another two areas (Datuk Keramat 10.4% and Jinjang Utara none).

4.1.3   Community Groups' Involvement in Waste Management

Nearly one-half (49.7%) of all respondents indicate that community groups in their residential areas give attention to waste problems. The percentage differs significantly among areas ($p < 0.01$), with the percentage highest in Datuk Keramat (76.0%), followed by 73.0% in Sentul and no respondent reported such the view in Jinjang Utara. Of the 149 respondents indicating the existence of community groups giving attention to waste problems, the following percentages reported the following community groups to encourage such community actions: 66.4% local people, 37.6% neighbourhood security groups, 34.9% people's associations, 20.1% local town authority, 1.3% community centre and 0.7% non-governmental organisations.

Of the 149 respondents indicating the existence of community groups giving attention to waste problems, the following percentages reported the types of actions by the community groups: 94.0% indicated that they arrange community group action to clean the area, 40.9% present views concerning waste to local town authority or private waste contractors, 39.6% arrange a cleaning campaign in the area, 22.1% provide public dust-bins, 5.4% provide dust-bins to individual houses and 0.7% for each of the actions such as arrange or encourage a recycling program in the area have a representative in local town authority and do not know.

4.1.4   'Source Reduction' of Waste Materials

More than 41% of all respondents reported that they have heard about 'source reduction' of waste, which means measures taken by agencies and individuals to keep waste from entering the waste stream (in contrast with 'recycling' which is finding a benign use for waste that enters the waste stream). Percentages of such respondents differ significantly among areas ($p < 0.01$), with the highest in Datuk Keramat (75.0%), followed by 37.0% in Jinjang Utara and 13.0% in Sentul. By far, the most common sources of information about source reduction of waste for all respondents collectively are television (95.2% of respondents who have heard about source reduction of waste) and newspapers (91.2%), followed by 'other sources' (9.6%), local town authority (7.2%) and private waste contractor (5.6%). The most important information sources in Jinjang Utara are television (100.0%) and newspapers (83.8%). Most important sources in Sentul are newspapers (84.6%) and television (76.9%). In Datuk Keramat, both the information sources of television and newspapers are most important with the same percentage (96.0% each).

4.1.5   Method of Source Reduction

Ninety-six percent of respondents, who have heard about source reduction of waste, indicate that the most important method of achieving such source reduction is through reusing waste materials that would otherwise be disposed. The second method followed as means for source reduction includes repairing things that are damaged and reusing them (85.6%) and when buying something, considering whether its package can be reused (70.4%), considering possibilities for reusing the product (63.2%) and considering the amount of packaging included with the product (52.0%). The third includes when buying something considering the durability of the product (50.4%) and considering whether the product is made from renewable resources (42.4%). All the methods of source reduction differ significantly among areas ($p < 0.01$, except for the first method, which is significant at $p < 0.10$ level).

4.1.6   Suggestions for Reducing the Sources of Waste

More than 96% of respondents, who have heard about source reduction of waste, have suggestions for their respective local town authority to encourage others to source-reduce waste. The most commonly offered suggestion is undertaking a waste source-reduction campaign (74.4%), followed by providing information concerning possible ways to source-reduce waste (71.9%) and providing information on reasons underlying a waste source-reduction program (67.8%).

4.2   Householders' 'Attitude' Toward Solid Waste and Related Matters

4.2.1   Satisfaction with Waste Collection and Disposal Services

Of the all respondents interviewed, 47.4% indicated that they are 'satisfied' and 5.8% 'very satisfied' with the waste situation in their residential areas. In contrast, 37.5% indicated that they are 'dissatisfied' and 9.2% 'very dissatisfied' with local waste conditions. Differences in householders' views on local waste condition differ significantly among areas ($p < 0.01$), with highest dissatisfied householders were reported in Jinjang Utara (83.0%), followed by 22.9% in Datuk Keramat and only 5.2% in Sentul. On the other hand, the highest number of satisfied householders was reported in Sentul (89.2%), followed by 54.2% in Datuk Keramat, and no householder was reported in Jinjang Utara, who is satisfied with local waste conditions.

Table 1 Percentages of 'yes' responses of respondents to possible waste collection problems within individual areas

Waste collection problem	Jinjang Utara	Sentul	Datuk Keramat	Total
	Percentage			
People in this area dispose of waste everywhere	87.0	90.9	93.9	88.9 (NS)
When waste collectors collect waste, they do not collect all the waste	30.0	63.6	84.8	45.1*
Too infrequent collection of waste	80.0	54.5	87.9	79.9**
Time of waste collection is not fixed	89.0	54.5	87.9	86.1*
No dust-bins for my waste	100.0	45.5	42.4	82.6*
Dust-bins provided too small	46.0	45.5	84.8	54.9*
Dust-bins supplied not covered	50.0	54.5	75.8	56.3***
Public dust-bins are too far from my house	83.0	72.7	60.6	77.1***
Areas around public dust-bins are dirty	100.0	54.5	87.9	93.8*
No way to dispose of bulky waste, e.g. furniture, refrigerators	52.0	45.5	84.8	59.0*
Dogs, cats and/or big rats search for food in the waste	100.0	63.6	84.8	93.8*
Mosquitoes or flies are attracted to waste	100.0	54.5	81.8	92.4*
Street cleansing services are not good	67.0	72.7	39.4	61.1***
Drainage cleaning services are not good	99.0	81.8	57.6	88.2*
Waste compactor lorries come here too often	18.0	36.4	12.1	18.1*

Note: No respondent reported 'other reasons' to possible waste collection problems.
NS, not significant at 0.10 level.
*Significant difference among areas at 0.01 level.
**Significant difference among areas at 0.10 level.
***Significant difference among areas at 0.05 level.

The highest number of very satisfied householders was reported in Datuk Keramat (15.6%), and no householder in Jinjang Utara reported such view. The highest number of very dissatisfied householders was reported in Jinjang Utara (17.0%) and lowest in Sentul (3.1%).

4.2.2 Sources of Dissatisfaction with Local Waste Conditions
Of the 137 respondents who are either 'dissatisfied' or 'very dissatisfied' with local waste conditions, the two problems with the same highest perceived percentages are 'areas around public dust-bins are dirty' and 'dogs, cats and/or big rats search for food in the waste' (93.8%). Differences among areas in the number of perceived percentages of the above-mentioned problems are also statistically significant at the same level ($p < 0.01$). The other 14 possible sources of dissatisfaction with local waste conditions, to which respondents reacted, have been summarised in Table 1.

4.2.3 Reasons for Households Recycling
The most common reason for households recycling is to 'receive payment for materials recycled'. The relative importance of this reason differs significantly among areas ($p < 0.01$), with the greatest importance

Table 2   Reasons for households choose to collect and recycle waste materials

Possible reason*	Jinjang Utara	Sentul	Datuk Keramat	Total
	Mean score†			
Protect the environment	1.62	2.00	3.70	1.88‡
Protect human health	1.82	1.57	3.70	1.92‡
Avoid waste	2.33	2.50	3.30	2.45 (NS)
Improve appearance of my area	1.75	1.43	3.50	1.82‡
I feel good because I have done something to improve my community/the environment	1.63	1.43	2.90	1.69§
Save resources	3.36	1.71	2.00	2.86‡
Reduce total amount of waste that has to be burned or placed in dumpsites	2.30	3.07	3.50	2.58§
My religion tells us to use resources carefully	1.07	1.43	3.80	1.39‡
Encouragement from family members	2.22	1.32	1.90	1.98§
Reduce costs of waste collection and disposal	1.70	1.79	2.60	1.80 (NS)
Social pressure from family members	1.58	1.18	1.70	1.50 (NS)
Receive payment for materials recycled	4.89	4.25	4.10	4.67‡
Social pressure from neighbours	1.14	1.11	1.40	1.15 (NS)
Encouragement from neighbours	1.14	1.11	1.40	1.15 (NS)

Note: NS, not significant at 0.10 level.

*No respondent reported any 'other reasons' for which he or she collects and recycles waste materials.

†Mean scores of relative importance, where 1 = not very important, 2 = not important, 3 = medium important, 4 = important and 5 = very important.

‡Significant difference among means at 0.01 level.

§Significant difference among means at 0.05 level.

in Jinjang Utara and the least importance in Datuk Keramat. The other 13 reasons for recycling, to which respondents reacted, have been summarised in Table 2.

4.2.4   Reasons for Households not Recycling

The most common reasons for households not recycling are 'do not have enough time to sort, save and transport materials' (76.9%) and 'do not have enough room in my home to store materials' (73.6%). For both the reasons, percentages of respondents differ significantly among areas ($p < 0.01$), with the percentages for the first reason being highest in Jinjang Utara and lowest in Sentul and for the second reason being highest in Datuk Keramat and lowest in Sentul. The other eight possible reasons for households not recycling have been summarised in Table 3.

4.2.5   Motivations for Households to Recycle

The empirical results of this study reveal that recyclers are significantly more strongly motivated by personal than social reasons to recycle (Table 4). This result is supported in that the 'personal reasons means' of 2.01 in squatters, 2.47 in low-cost flats and 2.18 for all householders collectively in the two groups of communities are significantly greater than the respective 'social reasons means' of 1.83, 2.23 and 1.97 for the two communities individually and collectively ($p < 0.05$). The mean scores are significantly greater for low-cost flat dwellers than the squatter householders for the 'personal reasons means' (2.47 versus 2.01)

Table 3   Reasons for households not collecting and recycling waste materials within individual areas

Reason	Jinjang Utara	Sentul	Datuk Keramat	Total
	Percent			
Do not yet know about recycling	0.0	23.9	14.3	16.6*
No recycling program here	0.0	6.9	52.7	29.1**
Not interested in recycling	78.9	41.7	51.6	50.5*
Do not have enough time to sort, save and transport materials	100.0	54.2	90.1	76.9**
Do not have enough room in my home to store materials	68.4	52.8	91.2	73.6**
Recycling collection point is too far away	0.0	41.7	44.0	38.5**
Not satisfied with the current recycling program	0.0	13.9	48.4	29.7**
No buyer for or place to sell recycled materials	0.0	54.2	47.3	45.1**
Recycling program is not mandatory	0.0	0.0	73.6	36.8**
Other reasons	31.6	0.0	2.2	4.4**

*Significant difference among areas at 0.05 level.

**Significant difference among areas at 0.01 level.

($p < 0.05$) and 'social reasons means' (2.23 versus 1.83) ($p < 0.01$). In all instances in which mean scores for individual reasons differ significantly between squatters and low-cost flats ($p < 0.01$), mean scores are greater for low-cost flats, except for the reason namely 'reduce total amount of waste that has to be burned or placed in sanitary landfills (dumpsites)', which is significant at '$p < 0.05$' level and greater for squatters than the low-cost flats (2.86 versus 2.09). The mean scores for individual reasons for recycling are significant at '$p < 0.01$' level and also greater for low-cost flat dwellers, which have been summarised in Table 4.

Table 4 shows that there is a stronger motivation by householders in low-cost flats to recycle waste materials than those in squatters. But, in the extent of economic gain of recycling, mean scores for both communities do not differ significantly ($p \geq 0.10$). That means, the economic reasons mainly lead householders to recycle waste materials, and this attitude has been observed to be the same for both communities. This result is also supported in that there is no meaningful explanation of means between extrinsic and intrinsic motivations for recycling among householders in squatters and low-cost flats. But the economic reason means (to receive payment for materials recycled) are greatest in importance for both communities (squatter: 4.74 versus low-cost flat: 4.56) compared to all other extrinsic and intrinsic reasons means.

4.2.6   Motivations for Environmentally Sound Solid Waste Management

The interesting finding of this study is that the householders are significantly more strongly motivated by economic reasons to practice environmentally sound solid waste management. This finding is supported that the means for economic reasons, for which householders practice environmentally sound solid waste management, such as sell the waste to an 'itinerant' buyer ($p < 0.01$), have practice of collecting and recycling waste materials ($p < 0.01$); separate waste materials in order to their kinds ($p < 0.05$), reuse waste materials ($p < 0.05$) and source reduction of waste ($p \geq 0.10$) are significantly greater for the householders with low level of income. Moreover, the means for the above-mentioned economic reasons are significantly greater ($p < 0.01$) for the householders with low level of education. In different education levels

Table 4   Personal and social reasons for recycling for households in squatters versus low-cost flats

Personal and social reason	Squatter	Low-cost flat	Total
	Mean score*		
Personal			
Improve appearance of my area	1.84	1.79	1.82 (NS)
I feel good because I have done something to improve my community and the environment	1.38	2.23	1.69**
My religion tells me to use resources carefully	1.28	1.58	1.39 (NS)
Encouraged by members of my family	1.57	2.72	1.98**
Social pressure from members of my family	1.25	1.93	1.50**
To receive payment for materials recycled	4.74	4.56	4.67 (NS)
Personal reasons means	2.01	2.47	2.18***
Social			
Protect the environment	1.52	2.51	1.88**
Protect human health	1.52	2.61	1.92**
Avoid waste	2.07	3.14	2.45**
Reduce total amount of waste that has to be burned or placed in sanitary landfills (dumpsites)	2.86	2.09	2.58***
Reduce costs of waste collection and disposal	1.50	2.33	1.80**
Social pressure from neighbours	1.24	1.00	1.15 (NS)
Encouragement from neighbours	1.24	1.00	1.15 (NS)
Social reasons means	1.83	2.23	1.97**

Note: NS, not significant at 0.10 level.

*Mean scores of relative importance, where 1 = not very important, 2 = not important, 3 = medium important, 4 = important and 5 = very important.

**Significant difference among means at 0.01 level.

***Significant difference among means at 0.05 level.

of the householders, the reason 'separate waste materials in order to their kinds' is highly significant ($p < 0.01$). These findings imply that the householders with low levels of income and education are strongly motivated to practice environmentally sound solid waste management. This occurs due to the fact that economic hardship of the low-income people forces them to do so. Hence, it can be certainly argued that poverty or economic inability does not cause environmental degradation, particularly in household solid waste management.

4.3   Householders' 'Behaviour' Concerning Solid Waste Management

4.3.1   Quantity of Households Waste Generation

All the households covered in the survey generate, every 3 days, an average of 5.66 kg of waste. Of all respondents, the following percentages generate the following quantity every 3 days: 28.3% up to 4.00 kg, 46.0% from 5.0 to 6.0 kg, 12.6% from 7.0 to 8.0 kg, 11.7% from 10.0 kg and 1.3% from 12.0 to 15.0 kg. The quantity of waste generation differs significantly among areas ($p < 0.01$), with the highest average was reported in Sentul (6.92 kg), followed by 5.83 kg in Jinjang Utara and 4.22 kg Datuk Keramat.

4.3.2 Length of Time Waste is Stored in the House

More than 74% of all householders reported that they are storing household waste in their homes for 1-2 days before placing it outside for collection, 18.3% for as long as 3-4 days and 2.0% for as long as 5-7 days. More than 7% of all householders reported placing their waste at kerbside on the day it is generated rather than storing it inside their homes for later disposal. Compared with Jinjang Utara and Datuk Keramat, significantly ($p < 0.01$) more householders in Sentul are storing their waste in their homes for 1-2 days before placing it outside for collection (87.0 versus 79.0 and 57.0%) and significantly ($p < 0.01$) fewer householders in Jinjang Utara store their waste for 3-4 days compared with Datuk Keramat and Sentul (6.0 versus 39.0 and 10.0%). In Jinjang Utara, significantly ($p < 0.01$) more householders place their waste at kerbside on the day it is generated (15.0%), followed by fewer percentages are 6.0% in Datuk Keramat and 1.0% in Sentul. No households in Jinjang Utara reported that they are storing their waste for 5-7 days before placing it outside for collection, and this length of time does not differ significantly among areas ($p \geq 0.10$).

4.3.3 Method of Source Reduction

Of the 28 surveyed households who have practiced source reduction of wastes, the most common methods for source reduction are reusing waste materials (92.9%) and repairing and reusing things that are damaged (85.7%). Other methods of source reduction all involve considerations by householders when deciding whether to buy particular products. The most important such consideration is the durability of the product (57.1%), followed by whether the products' package can be reused (50.0%), possibilities for reusing the products (28.6%), amount of packaging included with the products (17.9%) and whether the products are made from renewable resources (17.9%). Except for the third, fourth and fifth above-mentioned methods, percentages of householders for all other methods differ significantly among areas ($p < 0.01$).

4.3.4 Ways of Reusing Waste Materials

The following percentages of households reported that they are reusing materials, which otherwise would be disposed as waste, in the following ways: nearly 86.0% of households repair used materials, 83.0% use materials for a different purpose, 63.0% sell used materials for reuse or to others and nearly 42.0% of households give used materials to other people. All the above-mentioned methods of reusing waste materials differ significantly among areas ($p < 0.01$, except for the latter way, which is significant at '$p < 0.05$' level), with above-average percentages of households in both Jinjang Utara and Sentul have been repairing used materials (92.0%), in Datuk Keramat giving used materials to other people (45.0%) and in Jinjang Utara selling used materials to others (100.0%), giving used materials to other people (50.0%) and using materials themselves for a different purpose (96.0%).

4.3.5 Length of Time of Recycling Waste Materials

Of the 119 householders who recycle, 58.0% have been doing so for more than 1 year, 13.0% for 6 months to 1 year, 5.0% for 1 to 6 months, and more than 23.0% respondents indicated that they cannot remember the length of time of recycling the waste materials. Length of time of recycling differs significantly among areas ($p < 0.01$), with householders in Jinjang Utara being the most 'seasoned' recyclers and those in Sentul being the most recent to recycle. A significant number of householders, who recycle, indicated that they could not remember the length of time of recycling waste materials.

4.3.6 Incidence of Waste Materials Recycling

Of the all recyclers, 91.0% recycle newspapers, 80.0% tin, 79.0% aluminium, 30.0% plastic, 25.0% glass and 8.0% papers. In addition, 36.0% of recyclers indicated that they recycle 'other materials'. Among the other materials, leather items are significant, and the percentage of recyclers who recycle such item is limited to Jinjang Utara (53.0%) ($p < 0.01$). The percentages of householders recycling various waste

materials in different areas differ significantly ($p < 0.01$), except for the first and fifth above-mentioned items, which are not statistically significant ($p \geq 0.10$).

4.3.7 Disposition of Recycled Materials

Of the all recyclers, 97.0% sell their recycled materials to itinerant buyers who come to their homes, 6.0% take them to public recycling collection centres, 2.0% place them in their own dust-bins and 1.0% gives them to their children who take them to school for recycling. Outside the above-mentioned dispositions of recycled materials, 10.0% indicated that they have 'other purposes' with their recycled materials. Among the other purposes, 'recyclers take their particular recycled materials to a nearest recycling shop for selling them in a reasonable price' is important. All the above-mentioned percentages differ significantly among areas ($p < 0.01$, $p < 0.05$).

5 Conclusion

In regard to solid waste generation, the study shows that urban poor and low-income groups usually generate a small amount of waste per person. This study also shows that the urban poor and low-income groups play a very positive role from a sound environmental perspective, as they are the main reusers, recyclers and source reducers of solid wastes. This finding is indeed crucial as it runs against the widely voiced assertion in the literature that the poor contribute for much more to degrading the environment in relation to the better-off. Such a finding, which set itself apart from the general theme in the literature, is indeed significant to sound environmental policy making, which does not unnecessarily militate against the poor. Moreover, the satisfactory behaviour pattern as ascribing to poor households is explainable upon reference to the tendency of the poor to explore and exploit income generation or saving activities and ventures. It seems plausible to make the assertion that solid waste management is quite a potential arena for capturing income generation and saving activities as a means of augmenting relatively poorer households' income. In fact, analysis of knowledge, attitude and behaviour of the urban poor and low-income groups concerning solid waste management gives evidence to the effect that neither reduction of poverty shall improve environmental quality nor improvement of environmental conditions would result in reduction of poverty. Being it the case, policies should be formulated to focus on promoting education and skills of the urban poor together with empowering them as a means of promoting their quality of lifestyles. In addition, policies for sustainable urban growth need to be adopted that could be realistically able to view each urban environmental problem relating to all other urban issues thereby creating a habitat, which makes city living attractive to all groups.

As stated by the UNCHS (1988) and WCED (1987), poverty and environment are often seen as inextricably linked, with the need to eradicate poverty as an initial step to protecting environment. This study concludes against this belief and instead proposes that the problems of poverty and environment need to be seen differently as both the problems are experienced by different groups of communities differently. It shows that there is no evidence of urban poverty being a significant contributor to environmental degradation. The environmental problems exist among the urban squatters and low-income communities are associated with inadequate provision for water, sanitation, drainage, waste collection and health care. These environmental problems can be greatly reduced by undertaking developmental projects and better provisions of infrastructures.

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