

# Awareness, Attitude and Behavioural Status of Waste Management: A Profile of Malaysian Contractors

Rawshan Ara Begum\* and Joy Jacqueline Pereira

Institute for Environment and Development (LESTARI), Universiti Kebangsaan  
Malaysia, Bangi 43600, Selangor D.E., Malaysia.

✉ rawshan@pkrisc.cc.ukm.my

Received November 13, 2007; revised and accepted March 31, 2008

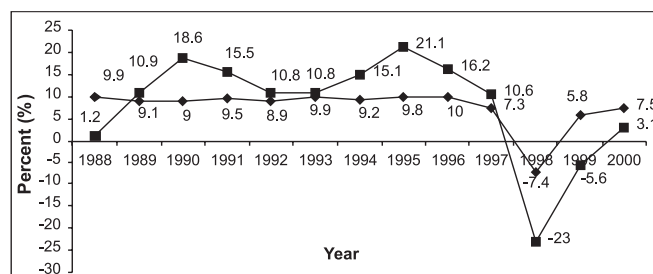
**Abstract:** This paper highlights the awareness, attitude and behavioural status of local contractors in the Malaysian construction industry with respect to waste management. It is pointed out from the findings that the contractors' behaviour, which is reflected by their attitude and awareness, tends to be different depending on their registration category to the CIDB such as large, medium or small contractors. The results also show that contractors are relatively less familiar with source reduction compared to recycling. Thus, the efforts to increase awareness among contractors in the Malaysian construction industry should be intensified as it will create a positive attitude and lead to improvements in their waste management practices. The findings of this study could help environmental and waste management planners in their decision making for managing construction waste and reducing environmental pollution in Malaysia.

**Key words:** Reduce, reuse and recycling, waste management, awareness, attitude, behaviour, construction industry.

## Introduction

The construction industry is an important sector for economic growth and social development of a country. Before the financial crisis of September 1997 the Malaysian construction industry enjoyed double-digit growth recording a maximum growth of 21% contribution to the GDP in 1995, 16% in 1996 and 11% in 1997 as shown in Figure 1. The crisis brought the construction industry to its lowest ever contraction of -23% in 1998. In 2000, the construction industry recovered from the negative devastating effect of the crisis and contributed 3% to the GDP.

The construction industry supports many aspects of government policies aimed to develop the nation such as housing, schools, hospitals, roads, airports, ports and other transportation infrastructure. Although the construction sector is vital to the achievement of national socio-economic development goals of providing



◆ GDP ■ Construction GDP, Based Year: 1987

**Figure 1: Construction growth from 1988 to 2000 in Malaysia. (Source: CIDB 2002)**

employment, shelter and infrastructure, they can be a significant source of negative impacts on the physical environment (Pereira, 2003). Among the major impacts associated with the industry are soil erosion and sedimentation, flash floods, destruction of vegetation and dust pollution (Lee and Fong, 2002). Other impacts of the industry are depletion of natural resources and the use of building materials harmful to human health. As the construction industry develops, it generates much

\*Corresponding Author

construction waste in Malaysia which contributes to a large portion of solid waste and causes significant impacts on the environment (Begum et al., 2006). The sources and quantities of municipal solid waste vary among local authorities in Malaysia depending on the size of township and level of economic standard (Agamuthu et al., 2004). Therefore, waste management has become an important issue for improving the growth and performance of the construction industry (Egan, 1998; Alwi et al., 2002; Kulatunga et al., 2006).

Herremans and Allwright (2000) demonstrated that the posture (awareness and attitude) leads to actions and performance (behaviour) regarding environmental management issues. Considerable research exists concerning the description and analysis of individual and household recycling behaviour (Coggins, 1994; McDonald and Ball, 1998; Schultz et al., 1995; Thøgersen, 1994, 1996; Tucker et al., 1998; Tucker, 1999; Vencatasawmy et al., 2000). McDonald and Ball (1998) stated that creating awareness is clearly a pre-requisite for the development of recycling schemes and showed a positive relationship between awareness and behaviour. Maycox (2003) demonstrated that understanding behaviour is the key to taking municipal solid waste minimisation forward, but that there are very significant barriers for the general public such as lack of knowledge, motivation and influences, via social norms. Barr et al. (2001) emphasised the complex link between environmental attitudes and environmental actions and have produced a conceptual framework with three predictors with respect to behaviour, namely, environmental values, situational variables and psychological variables. Their research indicated that recycling behaviour is likely to be influenced by convenience, knowledge and access to a kerbside scheme, whereas waste minimisation behaviour is more likely to be driven by a concern about environmental issues. In regard to construction waste management, Lingard et al. (2001) also stated that the extent to which reduction, reuse and recycling of waste can be achieved depends, to a large extent, on motivational influences on the behaviour of construction workers. Teo et al. (2000) stated that the labour intensive nature of construction activity suggests that behavioural impediments are likely to influence waste levels significantly.

The above discussion shows that the awareness, attitude and behaviour of the contractors or people involved in the construction industry play a significant role in minimising construction waste generation. This paper highlights the awareness, attitude and behavioural status of Malaysian contractors with respect to waste

management. The findings generated from this study could help environmental and waste management planners in their decision making for managing construction waste and reducing environmental pollution in Malaysia.

## Methodology

The data in this study is based on a survey of registered local contractors in the Malaysian construction industry. The survey was conducted through interviews with contractors in the Klang Valley, adjacent to Kuala Lumpur, specifically in Kajang, Petaling Jaya, Subang Jaya and Seri Kembangan. The “purposive stratified random sampling” method was used focusing on three major groups of contractors who are involved in general building and construction activities. The contractors are registered with the Construction Industry Development Board of Malaysia (CIDB) and categorised based on their paid up capital, tendering capacity and availability of personnel. Group A comprises G6 and G7 (large) contractors, Group B comprises G4 and G5 (medium) contractors and Group C consists of G1, G2 and G3 (small) contractors. The final survey was based on 130 samples of contractors i.e. 35 from Group A, 35 from Group B and 60 from group C. Interviews were based on a set of questionnaires that were pre-tested and modified before being used in the survey. Simple descriptive statistics such as averages, ranges and percentages and statistical analysis such as the ‘t’ test were used to analyse data from the survey.

## Results and Discussion

The findings of the survey are discussed below. The discussion focuses on the contractor’s awareness, attitude and behaviour regarding waste management in terms of source reduction (reduce) and recycling practices, waste collection services and waste disposal methods. It has been reported that the preferred method of waste management is source reduction, followed by reuse, recycling, treatment and then proper disposal (ESH, 2001). The term waste minimisation refers to the 3 R’s i.e. reduce, reuse and recycle (Lorton et al., 1988). Begum et al. (2007) discussed in their previous research that waste minimisation includes source reduction and recycling. Source reduction is defined as any activity that reduces or eliminates the generation of waste at the source, usually within a process. Recycling is defined as the recovery and/or reuse of what would otherwise be considered waste material.

## Awareness Regarding Waste Management

### *Awareness of source reduction and recycling*

Table 1 shows that 79% of the contractors surveyed have heard about the source reduction of waste materials whereas 87% are aware of recycling, which indicates that they have already heard of these terms associated with the waste management hierarchy. It is also observed that the respondents' awareness of source reduction and recycling is significantly different ( $P < 0.01$ ) among the group of contractors, with the highest in Group A followed by Group C and Group B. Source reduction and recycling are important measures of waste minimisation (Lorton et al., 1988; Sherman, 1996; Maclaren, 2002).

Table 2 presents the sources of awareness for source reduction (for 103 contractors) and recycling (for 113 contractors) for those who have heard about these measures of waste minimisation. The survey shows that the most common sources of awareness for source reduction are television (78%), newspapers (70%) and internet (55%), followed by the local authority (36%),

seminar/conference/workshop (27%), Construction Industry Development Board (CIDB) (22%) and contractors' association (20%), among others. The most common sources of awareness for recycling are newspapers (81%), television (69%), internet (48%) and seminar/conference/workshop (47%) followed by the local authority (31%), CIDB (26%), contractors' association (21%), private waste contractor (16%), non-government organisation (NGO) (15%) and foreign sources (6%).

### **Waste Collection Services**

Table 3 summarises the respondents' views on waste collection at their construction sites. The results show that all of the contractors surveyed are aware about waste collection services, which means they know who collects the waste at the construction sites. A majority (54%) of the contractors collect their own waste (self disposal), while others engage private waste collectors or contractors (45%). Only one contractor claimed that waste collection services are provided by other services

**Table 1: Source reduction and recycling awareness**

Category of contractors	Aware of source reduction				Aware of recycling			
	Number		Percentage		Number		Percentage	
	Yes	No	Yes	No	Yes	No	Yes	No
Group A (G6 and G7)	28	7	80.0	20.0	32	3	91.4	8.6
Group B (G4 and G5)	27	8	77.1	22.9	29	6	82.9	17.1
Group C (G1, G2 and G3)	48	12	80.0	20.0	52	8	86.7	13.3
Total***	103	27	79.2	20.8	113	17	86.9	13.1

\*\*\* indicates significant at 0.01 level.

**Table 2: Sources of awareness for source reduction and recycling**

Sources	Aware of source reduction		Aware of recycling	
	Number of contractors	% of contractors	Number of contractors	% of contractors
Local authority	37***	35.9	35***	31.0
Contractor association	21**	20.4	24***	21.2
Private waste contractor	14 <sup>NS</sup>	13.6	18*	16.0
CIDB	23***	22.3	29***	25.7
NGO	14 <sup>NS</sup>	13.6	17 <sup>NS</sup>	15.0
Seminar/conf./workshop	28***	27.2	53***	47.0
Newspaper	72***	69.9	91***	80.5
Television	80***	77.7	78***	69.0
Internet	57***	55.3	54***	47.8
Foreign sources	5**	4.9	7*	6.2
Others sources	-	-	-	-

\*\*\* and \*\* indicate significant at 0.01 and 0.05 level respectively; <sup>NS</sup> indicates not significant at 0.10 level.

**Table 3: Waste collection services at the construction sites**

<i>Waste collectors</i>	<i>Group A</i>		<i>Group B</i>		<i>Group C</i>		<i>Total***</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Private waste collector or contractor	19	54.3	14	40.0	26	43.3	59	45.4
Self disposal (own company)	15	42.9	21	60.0	34	56.7	70	53.8
Others	1	2.9	-	-	-	-	1	0.8
Total	35	100	35	100	60	100	130	100

\*\*\* indicates significant at 0.01 level; No. denotes number.

and not by self disposal or a private contractor. The view on waste collectors differs significantly among the contractor's category ( $P < 0.01$ ). The results reveal that a majority of the Group A contractors (54%) engage a private waste contractor to collect waste from their construction sites. On the other hand, a majority of the Group B (60%) and Group C (57%) contractors report that they collect their own waste.

The frequency of waste collection at construction sites is shown in Table 4. In the survey, 37% of the contractors reported that there is 'no schedule' to collect construction waste from the site. The survey also reveals that the frequency of waste collection differs significantly among the category of contractors ( $P < 0.01$ ). For example, only 6% of Group A and Group B contractors indicate their waste collection frequency is 'every day'. In addition,

9% of Group A and 7% of Group C contractors indicate their waste collection as 'once a month'.

### Attitude Towards Waste Management

#### *Source reduction and recycling attitudes*

Table 5 indicates that 50% and 46% of the contractors (who are aware of the source reduction and recycling) indicate a positive attitude (currently follow) towards waste reduction and recycling measures, respectively. The majority (54%) of contractors show a negative attitude or do not practice recycling of waste materials. The study also shows that the contractor's attitude towards source reduction and recycling are significantly different ( $P < 0.01$ ) among the three groups of contractors, with the highest positive attitudes in Group B, followed by Group A and Group C.

**Table 4: Frequency of waste collection at the construction site**

<i>Responses</i>	<i>Group A</i>		<i>Group B</i>		<i>Group C</i>		<i>Total***</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Everyday	2	5.7	2	5.7	-	-	4	3.1
Three times a week	1	2.9	2	5.7	2	3.3	5	3.8
Two times a week	7	20.0	6	17.1	6	10.0	19	14.6
Once a week	7	20.0	13	37.1	21	35.0	41	31.5
Once a month	3	8.6	-	-	4	6.7	7	5.4
No schedule	11	31.4	11	31.4	26	43.3	48	36.9
Don't know	4	11.4	1	2.9	1	1.7	6	4.6
Total	35	100	35	100	60	100	130	100

\*\*\* indicates significant at 0.01 level.

**Table 5: Source reduction and recycling attitudes**

<i>Category of contractors</i>	<i>Following source reduction measures</i>				<i>Following recycling measures</i>			
	<i>Number of contractors</i>		<i>% of contractors</i>		<i>Number of contractors</i>		<i>% of contractors</i>	
	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>	<i>No</i>
Group A (G6 & G7)	12	16	43.0	57.0	14	18	44.0	56.0
Group B (G4 & G5)	15	12	55.6	44.4	16	13	55.0	45.0
Group C (G1, G2 & G3)	24	24	50.0	50.0	22	30	42.0	58.0
Total***	51	52	49.5	50.5	52	61	46.0	54.0

\*\*\* indicates significant at 0.01 level.

### *Satisfaction with the existing waste collection and disposal services*

Table 6 summarises the satisfaction level of waste collection and disposal services among the three groups of contractors surveyed. In this study, 85% of the contractors indicated that they are satisfied and 5% indicated that they are very satisfied with the existing waste collection and disposal services. Only 6% respondents indicated that they are dissatisfied with their existing waste collection and disposal services. About 3% of the respondents replied that satisfaction level was not applicable to them.

**Table 6: Satisfaction level of existing waste collection and disposal services**

<i>Satisfaction levels</i>	<i>Group A</i>		<i>Group B</i>		<i>Group C</i>		<i>Total***</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Very satisfied	-	-	3	8.6	4	6.7	7	5.4
Satisfied	33	94.3	28	80.0	50	83.3	111	85.4
Dissatisfied	-	-	3	8.6	5	8.3	8	6.2
Very dissatisfied	-	-	-	-	-	-	-	-
Not applicable	2	5.7	1	2.9	1	1.7	4	3.01
Total	35	100	35	100	60	100	130	100

\*\*\* indicates significant at 0.01 level. No. denotes number.

The contractor's opinion on the satisfaction level ( $P < 0.01$ ) of these services differ significantly among the three groups of contractors. The most dissatisfied contractors are from Group B (9%), followed by 8% in Group C.

Group A contractors are all satisfied with their existing services. None of the contractors in the three groups indicated that they are very dissatisfied with the existing waste collection and disposal services. On the other hand, the highest percentage of satisfied (including very satisfied) contractors is in Group A (94%), followed by Group C (90%) and Group B (89%).

### **Waste Management Behaviour**

#### *Source reduction and recycling behaviour*

The previous results show that about 79% of the 130 contractors surveyed are aware of source reduction while 89% are aware of recycling measures. In the case of attitude towards waste management, about 50% of these contractors practice source reduction while 46% follow recycling practices. The behaviour of contractors who follow source reduction measures (51 contractors) and the contractors who follow recycling measures (52 contractors) is summarised in Table 7.

The survey results show that the most important and common practices for source reduction are purchasing raw materials that are just sufficient (94% of the contractors), using input materials before expiry dates or damaged (82%), facilitate recycling by sorting different types of waste (77%) and buying repairable, refillable and durable materials (65%). Other important practices are buying materials that have reused packing (57%) and using non-toxic or less toxic products (45%), followed by the exchange of waste materials with others (39%),

**Table 7: Contractors' source reduction and recycling behaviours**

<i>Practices</i>	<i>Group A</i>		<i>Group B</i>		<i>Group C</i>		<i>Total*** contractors</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
<b>Source reduction practices:</b>								
Buying repairable, refillable and durable materials	7	58.3	10	66.7	16	66.7	33***	65.0
Buying materials that have reused packing	6	50.0	9	60.0	14	58.3	29***	57.0
Using non-toxic or less toxic products	6	50.0	6	40.0	11	45.8	23**	45.0
Changing design of the construction process	3	25.0	5	33.3	7	29.0	15 <sup>NS</sup>	29.4
Using low waste technology	5	41.7	2	13.3	11	45.8	18 <sup>NS</sup>	35.3
Offering education or training or reward programmes	3	25.0	5	33.3	4	16.7	12 <sup>NS</sup>	23.5
Facilitate recycling by sorting different types of waste	8	66.7	12	80.0	19	79.0	39***	76.5
Purchasing raw materials that are just sufficient	12	100	14	93.3	22	91.7	48***	94.0
Using materials before expiry dates or damaged	8	66.7	12	80.0	22	91.7	42***	82.4
Exchange of waste with others	5	41.7	8	53.3	7	29.0	20*	39.0
<b>Recycling practices:</b>								
Reuse of material	14	100	16	100	22	100	52 <sup>NS</sup>	100
Recycling of materials for resource recovery or as a by-product	8	57.0	10	62.5	11	50.0	29***	55.8

\*\*\*, \*\* and \* indicate significant at 0.01, 0.05 and 0.10 level respectively; <sup>NS</sup> indicates not significant at 0.10 level; No. denotes number.

using low waste technology (35%), changing design of the construction process (29%) as well as offering education or training programmes or reward programmes (24%) respectively. It can be noted that Shen and Tam (2002) found from a survey of construction practitioners that the lack of trained staff and expertise is the major barrier to implementing environmental management in the construction sector of Hong Kong.

The study also reveals that source reduction practices of contractors differ highly significantly ( $P < 0.01$ ) among the three groups except for three practices i.e. changing design of the construction process, using low waste technology and offering education or training programmes or reward programmes. Among the practices, purchasing raw materials that are just sufficient is widely practiced in the three groups i.e. Group A (100%), Group B (93%) and Group C (92%).

Differences in recycling of materials for resource recovery or as a by-product is highly significant ( $P < 0.01$ ) among the three groups of contractors whereas reuse of materials shows no statistical difference among the groups. For example, recycling of materials for resource recovery is widely practiced by Group B (63%) and Group A (57%) and least practiced by the Group C (50%). On the other hand, reuse of materials is widely practiced (100%) compared to recycling of materials for resource recovery among the surveyed contractors.

#### *Waste disposal method*

The waste disposal methods of contractors surveyed from the three groups are shown in Table 8. The majority of the contractors (65%) reported that their construction waste disposal method is landfill. On the other hand, 24% of the contractors disposed off their waste onto designated sites (where the predominant use of land is as a waste disposal site). About 5% of the contractors cited other sources such as nearby construction sites, anywhere of the place while 4% disposed off their waste at illegal dumpsites. Only 2% of the contractors disposed off their

waste in sanitary landfills. The results show that waste disposal methods among the contractors are significantly different ( $P < 0.01$ ). Disposal of waste at illegal dumpsites were not reported by contractors from Groups A and B. However, 8% of contractors from Group C reported waste disposal at illegal dumpsites.

### **Conclusion and Policy Implications**

It is pointed out from the findings that the contractor's behaviour, which is reflected by their attitude and awareness, tends to be different depending on their registration category to the CIDB such as large, medium or small contractors. A positive relationship between awareness, attitude and behaviour is obtained in terms of waste reduction and recycling with respect to the waste management hierarchy. This result tends to support Lingard et al. (2000), McDonald and Smithers (1998) and Teo et al. (2000) in their findings that the attitude to waste reduction is generally positive. It is also in line with Herremans and Allwright's (2000) study, which demonstrated that awareness and attitude leads to behaviour regarding environmental management issues. The results also show that contractors are relatively less familiar with source reduction compared to recycling. Thus, the effort to increase the awareness among contractors in the Malaysian construction industry should be intensified as it will create a positive attitude and lead to improvements in their waste management practices.

More than half the contractors surveyed reported the mass media, particularly television and newspapers, as the main source of information regarding waste management, followed by the internet. The next important sources are local authorities, technical meetings such as seminars, conferences and workshops, CIDB, contractor association, private waste contractors and NGOs. It shows that the CIDB and contractor associations have had little impact in increasing awareness regarding waste management among the contractors. In this regard, CIDB needs to enhance their role through launching of education projects and initiatives for awareness raising such as awareness campaign, training programmes, seminars, workshops, leaflets and brochures, among others, to reduce waste generation and improve industry's performance in waste management. CIDB should also seriously consider using the mass media as partners in this initiative and develop an appropriate waste management section on their website to be more effective.

The survey also reveals that all contractors are well aware of waste collection services, with a small majority practicing self disposal while the rest have arrangements

**Table 8: Contractors' waste disposal method**

<i>Methods</i>	<i>Group A</i>		<i>Group B</i>		<i>Group C</i>		<i>Total***</i>	
	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>	<i>No.</i>	<i>%</i>
Sanitary landfill	2	5.7	-	-	1	1.7	3	2.3
Landfill	20	57.1	28	80.0	37	61.7	85	65.4
Designated site	11	31.4	7	20.0	13	21.7	31	23.8
Illegal dumpsite	-	-	-	-	5	8.3	5	3.8
Others	2	5.7	-	-	4	6.7	6	4.6
Total	35	100	35	100	60	100	130	100

\*\*\* indicates significant at 0.01 level; No. denotes number.

with private waste collectors. In terms of collection frequency, only 3% of contractors practice daily disposal and a third of the contractors (37%) do not have a schedule. A majority of the contractors are not practicing source reduction and recycling measures and dispose off their waste at landfills. In this regard, the government can introduce a higher charge for construction waste disposal, which may reduce the amount of construction waste disposed off at landfills. Incentives should also be introduced to encourage source reduction and recycling. For example, CIDB could consider levy reduction for projects that practice a high level of source reduction and recycling, similar to the ongoing levy reduction programme to promote Industrialised Building Systems (IBS). The study also shows that there are contractors who dispose off their waste at illegal dumpsites or open places. To solve this problem the government can impose legislation specifically for construction waste and mandatory bonds can be imposed based on contractual terms, which could be refunded based on good waste management practices of the contractor.

### Acknowledgement

This paper is part of the research project entitled “Materials Security & Waste Management for Industrialised Building Systems (IBS)” funded by the Construction Research Institute Malaysia (CREAM), on behalf of the Construction Industry Development Board (CIDB) of Malaysia. The project is implemented by the Institute for Environment and Development (LESTARI) of Universiti Kebangsaan Malaysia. The contribution of the research group, in particular Prof. Chamhuri Siwar and Assoc. Prof. Dr. Abdul Hamid Jaafar, is gratefully acknowledged. We also wish to thank the contractors and their staff for providing information and data.

### References

- Agamuthu, P., Fauziah, S.H. and C. Simon (2004). Towards efficient waste management in a developing country (Malaysia) – The dilemma. Proceedings of the Nineteenth International Conference on Solid Waste Technology and Management, pp. 637-646.
- Alwi, S., Hampson, K. and S. Mohamed (2002). Waste in the Indonesian construction projects. Proceedings of the 1st International Conference on Creating a Sustainable Construction Industry in Developing Countries, Stellenbosch, pp. 305-315.
- Barr, S., Gilg, A.W. and N. J. Ford (2001). A conceptual framework for understanding and analyzing attitudes towards household-waste management. *Environ Plan A*, **33(11)**: 2025-2048.
- Begum, R.A., Siwar, C., Pereira, J.J. and A.H. Jaafar (2006). A benefit cost analysis on the economic feasibility of construction waste minimisation: The case of Malaysia. *Resources, Conservation and Recycling*, **48(1)**: 86-98.
- Begum, R.A., Siwar, C., Pereira, J.J. and A.H. Jaafar (2007). Implementation of waste management and minimisation in the construction industry of Malaysia. *Resources, Conservation and Recycling*, **51(1)**: 190-202.
- CIDB (2002). The Nation's Builders and Contractors Directory 2001-2002. Kuala Lumpur: Construction Industry Development Board of Malaysia.
- Coggins, P.C. (1994). Who is the Recycler? *Journal of Waste Management and Resource Recovery*, **1(2)**: 69-75.
- Egan, J. (1998). Rethinking construction: Report from the construction task force. London: Department of the Environment, Transport and the Regions.
- ESH (2001). Environment, safety and health manual. Volume III: Environment Controls and Hazards. USA: US EPA.
- Herremans, I. and D.E. Allwright (2000). Environmental management systems at North American Universities: What drives good performance? *Association of University Leaders for a Sustainable Future (ULSF)*, **3(3)**.
- Kulatunga, U., Amaratunga, D., Haigh, R. and R. Rameezdeen (2006). Attitudes and perceptions of construction workforce on construction waste in Sri Lanka. *Management of Environmental Quality: An International Journal*, **17(1)**: 57-72.
- Lee, J. and T.Y. Fong (2002). Environmental Management within the Development Approval Process in the Construction Industry. In: Pereira, J.J., Zainora Zainal and Zuhairi Abdul Hamid (Eds.). Good Environmental Practices in the Construction Industry, *Round Table Dialogues, No. 10*, Institute for Environment and Development (LESTARI), Bangi, 7-26.
- Lingard, H., Graham, P. and G. Smithers (2000). Employee perceptions of the solid waste management system operating in a large Australian contracting organization: Implications for company policy implementation. *Construction Management and Economics*, **18(4)**: 383-393.
- Lingard, H., Gilbert, G. and P. Graham (2001). Improving solid waste reduction and recycling performance using goal setting and feedback. *Construction Management and Economics*, **19(8)**: 809-817.
- Lorton, G.A., Fromm, C.H. and H. Freeman (1988). The EPA manual for waste minimization opportunities. USA: United States Environmental Protection Agency.
- Maclaren, V.W. (2002). Appropriate industrial waste management strategies for developing countries. *Waste Economy* (online;13 February 2002). <http://www.utoronto.ca/env/vietpro/waste/Chapt5.htm>.

- Maycox, A. (2003). The village initiative project: Achieving household waste minimisation in the rural locale. *CIWM Sci Tech Rev*, **4(3)**: 10-17.
- McDonald, S. and R. Ball (1998). Public participation in plastics recycling schemes. *Resources, Conservation and Recycling*, **22**: 123-141.
- McDonald, B. and M. Smithers (1998). Implementing a waste management plan during the construction phase of a project: A case study. *Construction Management and Economics*, **16(1)**: 71-78.
- Pereira, J.J. (2003). Waste Management in the Construction Industry – Issues and Challenges. Paper presented at the seminar on construction waste management. Organised by LESTARI, CIDB and FRIM, Putrajaya, 26 March, 2003.
- Schultz, P.W., Oskamp, S. and T. Mainieri (1995). Who recycles and when? A review of personal and situational factors. *Journal of Environmental Psychology*, **15**: 105-121.
- Shen, L.Y. and V.W.Y. Tam (2002). Implementation of environmental management in the Hong Kong construction industry. *International Journal of Project Management*, **20(7)**: 535-543.
- Sherman, L.R. (1996). Managing construction and demolition debris: A guide for builders, developers, and contractors. *Water Quality and Waste Management*, Publication Number: AG-473-19. Published by North Carolina Cooperative Extension Service.
- Teo, M.M.M., Loosemore, M., Masosszeky, M. and K. Karim (2000). Operatives attitudes towards waste on a construction project. *Annual Conference-ARCOM*, **2**: 509-517.
- Thøgersen, J. (1994). A model of recycling behaviour with evidence from Danish source separation programmes. *Journal of Research in Marketing*, **11(1)**: 145-163.
- Thøgersen, J. (1996). Recycling and morality: A critical review of the literature. *Environment and Behavior*, **28(4)**: 536-558.
- Tucker, P., Lamont, J. and G. Murray (1998). Predicting recycling scheme performance: A process simulation approach. *Journal of Environmental Management*, **53**: 31-48.
- Tucker, P. (1999). A survey of attitudes and barriers to kerbside recycling. *Environmental and Waste Management*, **2(1)**: 55-63.
- Vencatasawmy, C.P., Ohman, M. and T. Brannstrom (2000). A survey of recycling behaviour in households in Kiruna, Sweden. *Waste Management & Research*, **18**: 545-556.