Journal of Emerging Trends in Economics and Management Sciences (JETEMS) 10(2):78-89
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jetems.scholarlinkresearch.com

Behavioural Influences on Construction Materials Waste Management in the Construction Industry: A Study of Construction Firms In Ghana

Adams Abudi[1], Sheitu Abu[1] and Mohammed Bukari[2]
[1]Bagabaga Training College,
P.O. Box 35E/R, Education Ridge,
Tamale, Northern Region, Ghana,
Mampong Technical College of Education, P.O.Box 31, Mampong- Ashanti Region, Ghana.
[1]Bagabaga Training College, P.O. Box 35E/R, Education Ridge,
Tamale, Northern Region, Ghana.
Corresponding Author: Adams Abudi

Abstract
The construction industry produces considerable amounts of materials wastes generated on construction sites. The material waste produced has adverse effects on the environment and the cost of construction projects. The paper seeks to investigate influences of behavioral patterns of site managers on construction materials waste management within selected construction firms in Ghana. The study adopted a cross sectional survey design involving the administration of one hundred and twenty (120 questionnaires to site managers working with construction firms in selected districts within the Ashanti and Brong Ahafo Regions of Ghana. A response rate of 50% was achieved. The study revealed the key factors influencing site managers' attitudes towards construction material waste management which includes; personal experience, educational qualification, parental upbringing and community related influences. Also, the study revealed that site managers' attitudes towards construction material waste management is positive, but that their efforts to construction waste management was hindered by the lack of managerial commitment, absence of legal framework to regulate waste management practices by construction firms and the low levels of knowledge and skills in construction materials waste management. The study has made recommendations based on the findings of the study for effectively controlling material waste on construction sites in the study setting. Findings from this research therefore, would be useful as a guiding tool for the proper management and effective utilization of material waste by government, non–governmental organizations and the construction industry as a whole. In addition, it will provide a baseline measure of awareness for all construction industry practitioners in most Ghanaian construction sites, in their attempt to providing a more conscious, reliable and holistic effort towards waste minimization in Ghana.

Keywords: construction material waste, site managers, attitudes, Ghana, operatives

INTRODUCTION

The construction industry is regarded as the backbone of the infrastructural development of every country, providing the necessary physical structures for activities such as commerce, services and utilities. Additionally, the construction industry provides numerous employment opportunities and creates foreign and local investment opportunities. Despite all these significant contributions, the industry contributes considerable amount of waste materials, especially during construction and demolition activities. Construction and Demolition waste may be defined as "the waste resulting from the construction of new buildings, roads, remodeling and or the demolition of a structure". Unfortunately, in spite of the various attempts made to curb or minimize construction waste, the problem still persist. Globally, it is estimated that approximately 10 to 30% of waste disposed in landfills originates from construction and Demolition waste.

In many developed nations such as China, the United States and U.K, there have been several attempts including the enactment of legislative instruments to control construction waste generation, including its reuse, recycle and disposal. For instance, in the European Union, the 2008 frame work directive (Anonymous, 2008), require the EU member states to take all necessary measures to achieve the reuse, recycling and reduction of construction and demolition waste to a level exceeding the target of 70% by 2020.This, is not the case in developing countries particularly Ghana, where regulations has little or no impact on the management of waste in the construction industry. Many developing countries have not fully

embraced techniques such as recycling, reuse and recovery of construction waste, and efforts in this regards are rather unrealistic due to several challenges (Agamuthu, 2008; Kofoworola and Gheewala, 2009). The objectives of the study were to identify factors influencing attitudes of site managers towards materials waste management and to identify key constraints to minimizing construction materials waste.

Problem Statement

The adverse effect of waste in the Ghanaian construction industry has become a major environmental issue, due to the indiscriminate dumping or disposal of this waste into many landfill areas. Greater amount of this waste together with other forms such as commercial and industrial waste find their way into open drains causing blockages resulting in flooding and displacement of people and loss of property (environmental Protection Agency, 2000).

It has been reported that construction generates large amounts of pollutants, noise, dust and water (Ball, 2002, Morledge and Jackson, 2001). As a result, the industry has been encouraged to reuse, minimize waste and energy in construction in the use of buildings, use of environmental management systems (EMS) to reduce the pollution, enhance bio-diversity, conserve local environment, measure performance and set targets for the environment and sustainability (Ofori et al, 2001).

Though the building industry is very buoyant and a significant contributor to national development, coupled with the large investment by government, the industry has been slow to embrace environmentally friendly practices. For decades, landfill has provided a convenient and cost-effective solution to its wasteful practices (Mills et al…….1999).

However, the world is changing, resource depletion, global warming, increasing pollution levels, exponential population growth, a more educated and outspoken public and an increase legislative business environment are forcing the construction industry to take a more responsible attitude towards the environment. (Bossink and Browers, 1996, Poon, 1987, Faniran and Caban, 1998).

Almost without exception, waste management in the industry has largely focused on the well-known hierarchy of waste management, listed in order of importance comprising the 3Rs of waste minimization; that is, source Reduction, also known as prevention, Reuse and Recycling (Tam, 2009), followed by incineration with energy recovery and safe disposal.

Although these research have been successful, it seems largely to have neglected the importance of peoples influence and willingness to change their attitudes and behaviors towards waste management especially in the Ghanaian construction industry, which forms the basis of this thesis. Many are those who argue that new technologies are primarily responsible for the escalation of environmental degradation (Hill et al 1994), but it seems that people have been ignored in the waste management equation: a view supported by Skoyles and Skoyles (1987), Heino (1994), Seibelman et al (1994) and Olomolaiye et al. (1998).

Significance of the Study

Without prudent and effective waste management practices in Ghana, the construction industry will continue to be blamed as far as environmental pollution and degradation is concern.

Also, there will be increase in production cost, since contractors will be expected to find alternative means of disposing of waste.

Findings from this research therefore, would be useful for institutional and policy by government, non–governmental organizations and civil societies and the construction, industry as a whole.

In addition, it will provide a baseline measure of awareness for all construction industry practitioners in most Ghanaian construction sites, in an attempt to providing a more conscious and holistic effort towards waste minimization .

Limitation of the Study

In an attempt to carry out this dissertation, several challenges including the following were encountered.

The first and fore-most was the factor of time. There was limited time resulting in a lot of pressure from the work place, as one was compelled to combine duties and responsibilities at home, workplace together with this dissertation.

Secondly, getting in touch or contacting respondents to respond to questionnaires was another problem. This is as a result of the vast nature of the coverage area, and the difficulty in convincing respondents, to assure them of confidentiality.

The problem of finance was another factor. There was no enough finance to type, print and travel to most areas to administer questionnaires.

Lastly, there was also the lack of resources and equipment such as stationery, computers and accessories, to promote the smooth completion of this project.

REVIEW OF LITERATURE

Materials waste in the construction industry is a topical issue that is encountered in the research literature globally. Waste in general can be defined as any losses produced by activities that generate direct or indirect costs but do not add value to the product. Construction and demolition materials waste can therefore be explained as "the solid waste generated, by the construction, remodeling, renovation, repair, alteration or demolition of residential, commercial, government or institutional buildings, industrial and infrastructures such as roads, bridges, dams, tunnels, railways and airports. In a similar study, construction and demolition waste is also explain as waste generated from building, demolition and works for individual housing, commercial buildings and others. These wastes are in the form of building debris, rubbles, earth, steel, concrete, timber and mixed site clearance materials arising from various construction activities e.g. road works and building renovation (Shen et al, 2004).

The Building Research Establishment (BRE), defined construction waste as the difference between materials ordered and those placed for fixing on project sites (Skoyles, 1978), defined construction waste as "the difference between the value of those materials delivered and accepted on site and those used properly as specified and accurately measured in the work, after deducting cost of savings of substituted materials and those transferred somewhere" (Polat and Ballard; 2004; Pheng and Tam, 1998). In addition, Lean construction principles, promoted by several lean building and construction groups aim to reduce waste caused unpredictable work flow, defined construction waste in seven categories, as defects, delays due to waiting for upstream activities to finish, over-processing, over-production, maintaining excess inventory, unnecessary transport of materials and unnecessary movement of people. Based on the aforementioned definitions, the study adopts a definition of construction and demolition waste as material debris arising out of construction and demolition activities which are not incorporated into the permanent works. This definition includes debris such as rubble, earth, concrete, timber, bricks, steel, blocks, slates, tiles and other materials stated by Shen et al. (2004).

Sources and Causes of Construction Materials Waste

Past research into the causes of waste in construction projects indicates that waste can arise at any stage of the construction process, from inception, right through the design, construction and operation of the built facility. (Spivey, 1974; Gavilan and Bernold, 1994; Craven et al.1994; Faniran and Caban, 1998). They identified the sources and the causes of construction waste presented in Table 1 below.

Table 1: Sources and causes of construction waste

SOURCE (1)	CAUSE (2)
Design	Error in contract documents
Design	Contract documents incomplete at commencement of construction.
Design	Changes to design
Procurement	Ordering error, over ordering, under ordering and so on.
Procurement	Suppliers error
Materials handling	Damage during transportation to site/ on site.
Materials handling	Inappropriate storage leading to damage or deterioration.
Operation	Error by trades person or laborer.
Operation	Equipment mal-function.
Operation	Inclement weather
Operation	Accidents
Operation	Damage caused by subsequent trades.
Operation	Use of incorrect materials requiring replacement
Residual	Conversion waste from cutting uneconomical shapes.
Residual	Off cuts from cutting materials to length.
Residual	Over mixing of materials for wet trades due to a lack of knowledge of requirements.
Residual	Waste from application process.
Residual	Packaging
Other	Criminal waste due to theft.
Other	Lack of onsite materials control and waste management plans.

Source: Gavilan and Bernold (1994) and Craven et al., (1994)

In view this, criminal activities can cause waste in construction. The construction industry is constantly challenged with the high crime rate, and theft is an everlasting set back from staff on public building sites. Theft has a huge impact on time, money and productivity because material has to be re-ordered and more money has to be given out for the purchase of new material (Brulliard, 2005). Criminal waste is inevitable and the cost of extra-security has an additional cost on the contract sum.

In addition, construction projects are most vulnerable to vandalism during the finishing stages. Graffiti artist and children tend to play a big role in vandalism which ranges from breaking windows to spray painting freshly built walls. Vandalism is an international problem even occurring in the Soviet Union (Skoyles and Skoyles, 1987). There are two types of vandalism namely; intentional and unintentional. Intentional

vandalism is hard to prevent, as these are people who get pleasure out of ruining other people's property, but boosting up security should sort out the issue. To prevent unintentional vandalism, tougher and stronger materials should be used to resist damage like special paints and glazes to resist scratches (Skoyles and Skoyles, 1987). He further explains that storage and handling are other causes of waste in construction. This is because majority of the labour in the construction industry are unskilled. Unskilled labour is available at abundance as most countries are currently with recession and people are desperate for work. The availability of this cheap unskilled labour has major impact on construction material wastage. Poor workmanship and incorrect use of tools are factors which contribute to waste on most project sites. Apart from these, construction activities can generate waste from many sources such as design error, procurement or shipping error, materials handling, operation error as well as residual or left over scraps (Franklin Associates, 1998; Gavilan and Bernold, 1994).

Similarly, Faniran and Caban (1998), identified typical sources of construction waste as design changes, left over material scraps, waste from packaging and non-reclaimable consumables, design errors and poor weather, which can damage materials stored on site. It is also noted that construction activities generate chemical and other special waste. Other sources of waste include; improper purchasing by purchasing personnel which leads to a great deal of waste. Other sources of construction waste according include production waste, over production, waiting, transporting, processing, inventory, movements and making defective products. More sources of waste have been suggested by Koskela (2004) and Macomber and Howell (2004). This means that one of the problems that design management practices has to address is the waste associated with design process. Waste in design arises out of delays, waiting, design errors, over processing and negative alteration (Ballard, 2000). The waste arising out of these sources in the design process can have far reaching effect by under mining efforts towards delivering valuable construction products on time to clients. Other causes of waste are presented in Table 2 below.

Table 2: Other causes of construction and demolition waste

Application of construction material	Cause	Specification
Stone tablets	Cutting	Lack of turning between the sizes of different products, imperfections of the product, waste cutting choices in design; lack of influence of contractors and lack of knowledge about building during the design activities.
Stone tablets	Shape	Imperfections of product, choices made in design about specifications of the product; method of transportation.
Stone tablets	Quality	Choice of a low quality stone tablet in design, lack of influence of contractors and lack of knowledge about building during the design activities.
Stone tablets	Order too much	Lack of possibilities to order small quantities.
Stone tab.	Storage and handling on construction site	Unpacked supply.
Stone tab.	Cracking during transportation	Unpacked supply.
Piles	Cutting off the top	Method to lay the foundation of a building.
Concrete	Ordering too much	Required quantity of product unknown due to imperfect planning.
Concrete	Loss during transportation	Known due to imperfect planning.
Concrete	Scrapping off	Methods to lay the foundation of a building.
Sand-lime bricks and elements	Cutting	Use of a product of a size that does not fit.
Sand-lime bricks elements	Handling, storage and atmospheric influence	Unpacked supply.
Roof tiles	Sawing consequent on the design of the roof	Attention not paid to sizes of the used products in design, designer not familiar with possibilities of different products, information about the sorts and sizes of the products that will be used late: types and sizes of the different sizes of the different products do not fit.
Roof tiles	Cracking during transportation	Negligent handling by the supplier.
Mortar	Scrapping out	Negligent practice.
Mortar	Mortar in the tub.	Negligent practice.
Mortar	Atmospheric influence	Negligent practice.
Mortar	Specifications of the mortar	Short processing time.
Mortar	Mixing	Negligent practice, quantities of supply too high.
Packing	Unpacking	Throw away packing.

Source: Teixira (2005).

Attitudes Towards Waste Management

Attitudes represent people's evaluations of objects or situations that predispose them to behave in a certain way (Ajzen, 1993). It is widely accepted that an attitude has four dimensions, namely; "affective" (feelings/ emotions), "behavioral" (intentions/ actions), "cognitive" (knowledge/ beliefs) and "evaluative" (values/ likes or dislikes).People form attitudes because they help to give structure and priority to a complex world, providing some degree of consistency and Variety in an individual's explanation and interpretation of objects and situations. Attitudes are valuable also in enhancing a person's self-esteem, being a defensive mechanism to protect them from feelings of insecurity and inferiority, particularly in times of conflict. Finally, attitudes serve to express an individual's self-dignity and guiding values. They are important to managers because they determine the direction of people's behavior in response to a particular stimulus, and provide insights into appropriate motivating mechanisms.

In another development, "Attitude" is the positive or negative feeling towards a specific object and 'behavior', it is an action towards an object. Attitudes are generally based upon the positive or negative evaluation of the consequences of a given behavior and on personal beliefs about those consequences (Teo and Loosemore, 2001; Wang and Yaan, 2010). At the same time, behavioral decisions are frequently based on attitudes towards that object, whether consciously or not (Begum et al. 2009). However, the relationship between the two can be quite complex (Barre et al, 2001) and the empirical research on the attitude-behavior link has been yielding contradictory results. The attitudes of people involved in the construction industry play critical role in controlling the waste generation. Inter disciplinary approaches between all stakeholders are essential for successful waste management practices (Graham and Smithers, 1996). The importance of human factors in waste minimization was highlighted by Loosemore et al (2002) and Skoyles and Skoyles (1987) who argue that waste can be prevented by changing people's attitudes.

According to Begum et al (2009), factors such as the contractor's size, the education and training background of the contractor and the waste management practices applied, which includes source reduction, reuse and recycling measures, frequency of waste collection and disposal, influence the attitude and behavior of a contractor towards waste management. Due to the labour—intensive nature, human factors—an emerging topic for research in this field (Yuan and Shen, 2011)—reflected by attitudes towards waste management and therefore related behavioral impediments, are likely to exert key influence on waste management and generation (Loosemore et al. 2002; Teo et al, 2000). In particular, Skoyles et al (1974), identified that waste levels were more dependent on human factors than upon the type of construction or building company employed to do the work (Faniran and Caban, 1998). More recently, other research has suggested that waste management practices were directly related to existing activities and the behavioral tendencies of individuals involved in the construction process (Skoyles et al …. 1987: Lingard et al…. 2000). Indeed, studies by Soibelman et al (1994). Heino (1994) and Pinto and Agopyan (1994) have substantiated Skoyles et al (1987) earlier findings and concluded that a change in peoples attitude was much more important than changes in building technology. Collectively, these studies have highlighted the need for operatives to develop an awareness of the high value of materials and the adoption of more cautious work practices. It would appear that an understanding of operative's attitudes to waste management could make a significant contribution to reducing levels of construction waste. Operatives are defined in this research as site foremen, leading hands, tradesmen, laborers and other workers in technical, hands on capacity. Operatives are chosen because they make up the most direct contact with the materials being wasted.

Managers need to understand how attitudes are formed if they are to manage them. Research indicates that attitudes are shaped over time and change according to a variety of factors, the most powerful of which is an individual's personal experience of a situation or object (Malim, 1997). For example, if an individual has worked on a project where waste management practices were highly successful, then his/her attitude is likely to be positive. Other determinants include the generational 'cohort' effect, which refers to the attitudes acquired from growing up in a particular historical/ economical/ political environment. For example, it is probable that current concerns about global warming will make future generations for more concern than past generations about environmental issues (ENN, 1999).

Additionally, parents and families are important in shaping attitudes; because they exercise extensive control over the information a person receive in their most formative years (McGuire, 1985). More generally, the community at large has an important influence on attitudes, through the imposition of social norms that can invoke a sense of moral obligation towards society (Bratt, 1999). In a work context, work mates can exert a significant influence over attitudes through peer pressure and by determining acceptance into a group that provides security needs. Indeed, different occupations tend to develop different 'cultures', which can further influence attitudes by defining a member's role and status in that society, and expectations of that behavior. For example, the construction industry and

therefore its workers are generally perceived to have a very negative and wasteful attitude towards the environment. Such occupational cultures are shaped largely by people's common educational background, which determine their access to information about a particular issue. Environmental consciousness has traditionally not been taught as part of educational programmes for professionals in the construction industry. However, in modern times, this lack of education about the environment has been counteracted by the most powerful modern influence upon people's environmental attitudes: the 'mass media' (Chan, 1998). For example, in an investigation of the mass media's influence over environmental attitudes, the Roper Organization (1990) found that the order of influence was TV (75%), newspapers (65%) and radio (39%).Finally, laws are also a shaper of people's attitudes by dictating their perceptions of what is right and wrong in society's eyes. Indeed strict legislation is currently being seen as the way to moderate the wasteful practices of many industries such as construction.

The Influence of Attitudes upon Behavior

The relationship between attitudes and behavior is far from conclusive, and a number of theories have emerged to explain it. Most prominent among environmental research are; norm-activation theory, the Ipsative theory of behavior and the theory of planned behavior (Ajzen, 1993). Schwartz's norm-activation theory asserts that environmentally conscious behavior depends directly on the activation of altruistic moral norms rather than on general environmental concerns. People feel a sense of moral obligation if they expect serious negative outcomes for other people and if they feel responsible for a meliorating these consequences. While this theory reduces explanations of behavior to a dispositional level, it does not accommodate the many other mediating influences upon operative's attitudes towards waste, such as industry culture and project constraints.

By contrast, the ipsative theory of behavior goes beyond personal attributes in determining attitudes and behavior, focusing upon how intervening factors such as resource constraints can prevent pro-environmental attitudes being expressed in people's behavior. Unfortunately however, it has been widely criticized for ignoring social influences in environmental behavior, and has remained largely untested in the environmental arena. This cannot be said for the theory of planned behavior (Ajzen, 1993), depicted in Figure 1, which has been widely tested and refined, providing many insights into the full range of factors influencing people's behavior in an environmental context Taylor and Todd, 1995; Chan, 1998; Harland et al., 1999).Central to the theory of planned behavior is the 'behavioral intention' of an individual, which reflects how motivated he/she is to behave in a certain way. This is determined by three factors: attitudinal, social and perceptual. The attitudinal factor is based on individual's positive or negative evaluation of a particular type of behavior, and is based upon personal beliefs or knowledge about the outcome flowing from it. The social factor reflects an individual's sense of social pressure to behave in a certain way, and in the model, it is referred to as 'subjective norm'. The perceptual factor refers to an individual's perception of the ease or difficulty of performing the type of behavior, and reflects past experiences as well as anticipated obstacles to doing so. This is called 'perceived behavioral control'. Refer to Figure 1.

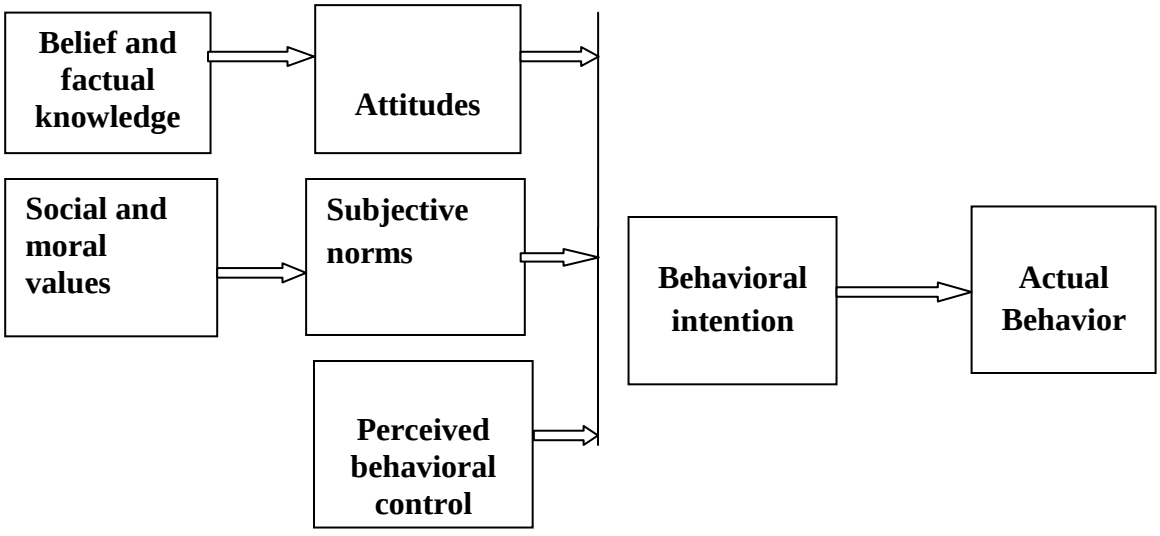

Figure 1 Theory of Planned Behaviour.
Source Ajzen (1993, p -182)

Construction Waste Management Practices

Poon et al (2004), defined waste minimization as "any technique, process or activity which avoids, eliminates or reduces waste at its source or allows reuse or recycling of the waste". This means that waste minimization includes source reduction and recycling. They defined source reduction as any activity that reduces or eliminates the generation of waste at source, usually within a process, and recycling as the recovery and or reuse of what would otherwise be a waste material. There are two types or distinct procedures in minimizing the amount of waste deposited into landfill sites through the construction process. The first, is to reduce the amount of waste generated through source reduction techniques on sites and during the design and procurement phases of a building project, and to improve the management of that waste that is generated on site. The second phase is described clearly by Johnston and Mincks (1992), who outlines waste management strategies for the construction manager. In particular, they examine the ways in which companies may plan for waste minimization and describes the problem associating responsibility between the main contractors and trade sub-contractors. This work is further developed with an assessment of available methods for improving waste management and for viewing waste management as a profit Centre in its own right (Johnston and Mincks, 1993).

In reducing construction waste, two principles prevail, first reduce the quantities of waste generated and secondly adopt an effective system of managing the unavoidable waste. There are three options in order of preference namely; reuse, recycling or disposal. The balance between the three will depend upon the nature of the materials and the cost effectiveness of each option. The cost will in turn depend on the availability of reusing and recycling options and the opportunities for reuse on a specific project.

(From U.K Essays.com, Issues of Construction and Demolition Waste Environmental Sciences). "Recycling construction and demolition waste is defined as reusing or reuse of a material. Besides that, recycling also means reprocessing of a reclaimed material and converting it into a new material or reuse". Recycling construction and Demolition Waste may be achieved in various ways. Deconstruction is one method of recycling construction and Demolition waste. Deconstruction is the disassembly of structures and reuse of their parts. It is believed that there is value in salvage materials.

In addition to the above, they identify good planning as the bedrock of effective and efficient means of waste management practice. "Good planning is the most important part of construction waste management. Good planning allows individual firms or project managers to identify all recyclable materials and how they are going to manage the site before the job starts. Good planning addresses how each material waste will be handled, what containers will be used, and when they will be on site and where each material will be marketed. Again, good planning allows companies to assess the cost and benefits of recycling and decide which materials to source separate, which to recycle as mixed debris, and which to discard as trash. Planning covers communications, training and troubleshooting, and lays out tracking and reporting procedures. The waste management plan is the document that lays out the start-to-finish strategy for job site recycling. It is prepared directly from the drawings and specifications for the job and a good plan will closely follow these documents. The waste management plan should include estimating quantities of wastes generated during each phase of the job, identify how each waste will be managed and marketed, provide an estimate of the over-all job recycling rate, layout plans for training, meetings and other communications related to job site waste management and provide troubleshooting in structures and contact information.

The waste management plan is the cornerstone for successful construction waste recycling and reduction. It is a comprehensive document that provides all of the necessary information needed by any individual on site to understand and achieve the waste management goals for the project. All of this should be done before you break grounds or during the planning stages so that recycling can be incorporated into the over-all performance of the job. It is best if the waste management plans is written and sign off by all parties (owner, architect and contractor) a month or more before site possession or before the first day of site work. This allows time for all parties to participate in developing the plan, allows contractors and sub-contractors to integrate recycling into their set ups and work plans, and assures that training can be provided to supervisors and workers. The waste management plan is also a living document, used as a day-to-day reference just like blue prints and specifications. Handling procedures or markets may change during the course of a job, these changes should be noted in modifications on the plan. As waste materials move from the site, information on waste and recycling tonnages and cost will be gathered. These should be matched against initial projections, variances, analyzed and a running recycling rate calculated. Besides that, the recycling rate should be publicized to all laborers and trades. It is a good way to help boost morale, and keep workers striving to achieve recycling goals (Construction Materials Management Guidelines, Feb, 1994).Apart from the above, means of recycling construction waste as a method of waste management control, other methods proposed by the (Boston Society of Architects in Recycling Construction and

Demolition Wastes, (A Guide for Architects and Contractors, April, 2005) include, source "separation and commingled Recycling".

METHODS

The study adopted a quantitative strategy involving survey questionnaires developed to elicit responses from respondents on their opinions and/or attitudes towards construction waste management. The target population of the study is all contractors registered with districts and municipal assemblies in selected regions of Ghana. There were in all 16 districts/municipal assemblies and the sampling frame comprising a list of all the target population elements which registered with the assemblies in the selected regions. It is notable that the list has repetitions of names of contractors because some contractors registered with more than one district/municipal assembly. The list of contractors was therefore edited before use as the sample of the study.

The study adopted simple random sampling to select six (6) districts/municipal assemblies out of the sixteen districts of the regions. The six assemblies included three each from the Sunyani and Kumasi metropolis respectively, since most contractors registered in these areas. The number of contractors registered with six assemblies constituted over 70% of contractors registered with assemblies in the two selected regions (Ashanti and Brong Ahafo regions) and therefore representatives of the contractors operating in Ghana. The six assemblies had a total of 119 contractors registered with them and constituted the sample of the study.

Questionnaire Development

Survey questionnaires were used to collect field data. The use of the questionnaire provides a valid, reliable and accurate firsthand information for the collection of data. However, before the development of the questionnaire, a pilot study or survey was conducted round some selected on-going projects within the Kumasi and Sunyani metropolis respectively, where the draft questionnaire was pre-tested and validated. This was aimed at obtaining a higher response rate of approximately 80%.

Finally, the questionnaire was designed to accomplish the fundamental objectives of the dissertation. The focal point of the questionnaire was to determine whether the attitudes and behavioral tendencies of site managers are positive or negative towards construction waste management and disposal practices. It also included questions to collect data on those factors which according to Begum et al (2009), influence contractor's attitude and behavior towards waste management. Some of the factors include; contractor's size, type, experience, education and training background of workers and waste management practices.

The questionnaire comprises four sections. Section 'A' represents Demographics of respondents, which indicates the age category, gender, position, highest academic qualification, company category, number of employees, etc. 'Section B' presents expert opinion on construction and Demolition waste management. In this section, respondents were asked to express their opinion using rating scale of 1 to 5 ticking. For example, questions were asked like, to what extend do you agree on the following management practices on your site. Please rate using a scale of 1 to 5. Strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5). The third section, Section C, presented some of the factors which are likely to affect people's attitudes towards waste management. Section D outlines general management practices of construction waste. Questionnaires were personally administered to local contractors working in their areas of operation. Most of these contractors were represented by their representatives, mostly site managers.

The data analysis was carried out using the Statistical Package for Social Sciences Software (SPSS). Data was further analyzed for significant bivariate associations using logistic regression. The cross tabulations and logistic regression model (LRM) were used so as to determine whether the attitudes and behaviors of contractors (site managers) were positive or negative and what might have caused that. The same method was implored to determine the relationship or correlation between those factors and attitudes of contractors in the study area (Begum et al. 2009).

$$\text{Log} = \frac{\mathbf{pi}}{\mathbf{1-pi}} = \boldsymbol{\beta}\mathbf{o} + \boldsymbol{\beta}\mathbf{i}\ \mathbf{Xi} + \mathbf{e}$$

Where pi= 1 if contractor's attitude or behavior towards construction waste is positive or satisfactory respectively, and pi= 0 if the contractors attitude is negative. Xi, are the independent variables. βo is a constant term; assumed zero; βi are the co-efficient of the independent variables; e is the error term; and i= 1, 2 ……n is the number of variables in the model. The direction of the relationship between the dependent variable pi (attitude or behavior) and the independent variable Xi is determined by the sign of the co-efficient βi.

RESULTS

A total of one hundred and twenty (120) questionnaires were administered to the survey respondents out of which sixty two (62) were duly completed and retrieved by the researcher. However, two of the completed questionnaires were not useable and were therefore not included in the analysis results. Thus, a

response rate of fifty (50) per cent was achieved for the study. This is quite a high response rate in comparison with past studies in similar settings. Reasons for the high response rate attained included personal contacts by the researcher with the respondents and follow up meetings with the regional executives of contractors association to impress on them on the importance of the research study.

Majority of the respondents that is 30 representing 50% were less than 30 years of age. Fifteen respondents representing 25% belonged to an age group of 31-40 and a further fifteen representing 25% belonged to an age category of 41-50 years. Out of the sixty respondents, 56 representing 93% were male while 4, representing 7% were female. This result is rather not surprising given the fact that construction work is a male-dominated profession. It was realized that 55 respondents representing 91%, were site managers, while 3 respondents adding up to 7% belongs to site foremen. One respondent each was recorded for both quantity surveyors and architects respectively representing 2% for this category.

It was observed that 56 respondents representing 93%, were CTC SS1, 11 advance and other technician holders. 4 respondents representing 7% were HND holders, while there were no responses for first degree, masters and PhD holders respectively. Majority of respondents belonged to firms with classifications K1D1 of 16 respondents and K2D2 also of response rate of 15 representing 26% and 25% respectively. While, 3 respondents each representing 5% for each category was recorded against firms with classifications K3D3, K4D4andK5D5 respectively, and 10 respondents representing 16% each belongs to K6D6 and K7D7 respectively. Two percent (2%) of respondents were of other classifications.

Waste Management Practices of the Construction Companies

Table 3, presents the waste management practices of the companies. It can be observed that the variables with the highest significant values include compliance with company policy on waste management, waste management is accorded high priority, compliance with legal requirement, and management has high commitment to waste control with reuse or recycle recording the least value. All the variables recorded the same differential values. This means that with the adoption and implementation of waste management policies construction waste could be reduced to considerable levels.

Table 3: Site managers' waste management practices as analyzed by the LRM

Variable	Estimated coefficient	Standard error	Wald statistics	Df	Significant value
Waste management is accorded high priority.	-0.228	0.563	0.341	1	0.547
Reuse or recycling	3.327	1.463	3.266	1	0.024
Waste management increases profit margin	-0.236	2.331	0.141	1	0.044
Compliance with company policy	2.440	5.016	1.117	1	0.761
Management has high commitment to waste control	4.556	2.246	5.046	1	0.446
Company policy	1.226	3.110	2.046	1	1.162
Compliance with legal requirement	2.116	4.011	1.126	1	2.066

Factors that Affect Attitudes to Waste Management Practices

The results from Table 4 suggest that an individual's educational background in a particular field is significant to solving an issue because it emerged as the variable with the highest significant value, followed closely by rules and regulations governing something and an individual's personal experience from a previous work are some of the factors that affect people's attitudes towards construction waste management.

Table 4: Factors affecting site manager's Behaviors towards waste management.

Variable	Estimated coefficient	Standard error	Wald statistics	Df	Significant value
Personal experience	1.007	0.248	2.148	1	0.428
Parents or families	2.343	1.344	2.678	1	0.190
The community	1.124	0.662	2.014	1	0.122
Occupational environment	-0.616	1.061	1.505	1	0.006
Educational background	1.177	2.071	2.165	1	0.616
Laws , rules and regulations	2.091	1.181	3.660	1	0.516
Untrained personnel	1.901	3.122	2.871	1	0.345

Constraints to Managing Waste

Table 5, which contains some of the key constraints to effective waste management, reveals that lack of management commitment to waste management is ranked highest. Other key significant factors are the lack of legal framework, low technology in waste management, lack of adequate training and poor communication came in that order.

Table 6: constraints to construction waste management

Variable	Estimated coefficient	Standard error	Wald statistics	Df	Significant value
Lack of legal framework	1.112	0.346	0.224	1	0.642
Lack of training	4.134	1.056	3.022	1	0.412
Poor communication	-0.111	0.412	0.241	1	0.024
Low technology	2.413	1.561	1.161	1	0.515
Low management commitment to waste management.	1.122	2.014	2.233	1	0.715

DISCUSSION OF RESULTS

Factors that Affect Behaviors in Waste Management

The results as illustrated by Logistic Regression Model (LRM)in table 4.Shows some of the most significant factors that shape site manager's attitudes towards waste management which includes; the individuals' personal experience in a situation or object, educational background, laws and regulations and the influence of parents and families.

A reasonable number of respondents especially 50% stated that their current knowledge in construction waste management has been influenced by previous experience, because if an individual had worked in an organization where waste management was successful, then his or her attitude will definitely be positive and the vice-versa. This assumption is confirmed by (Malim, 1997), who stated that the most powerful factor influencing an individual's attitude towards a situation or an object is that of personal experience. Furthermore, the analysis showed that site managers with higher level of education exhibited positive attitudes than those with lower educational backgrounds .Most of the respondents stated that education as a tool has increased their knowledge on the environmental consequences of waste, hence their positive attitudes. This is in contrast with the statement that the construction industry and therefore its workers are generally perceived to have negative and wasteful attitudes towards the environment.

A cross section of site managers were of the view that the community where an individual lives is a great shaper in the person's attitude, because communities that practice good environmental waste management will automatically inculcate in them positive attitudes than people who do not practice environmental cleanliness. It was also widely held by most respondents that parents or families were great contributors in shaping the attitudes of individuals. They indicated that the importance of families or parents in this regard could not be overruled, in the sense that every parent is responsible for the moral upbringing of their children. It therefore means that if a parent or family instills in an individual, a positive or negative attitude, that person is perceived to grow with that attitude, an assumption made by (McGuire, 1985) that parents and families are important in shaping attitudes, because they exercise extensive control over what an individual receives in their most informative years.

Key Constraints to Managing Waste Effectively

The data analysis from table 6, revealed some of the major constraints faced by site managers in their quest to managing construction and demolition waste. Even though most respondents demonstrated enough commitment to waste minimization, their efforts was greatly affected by factors such as low commitment of management to waste management, lack of legal framework, low technology and lack of training in effective and efficient waste minimization. The results clearly indicated that although about 30% of respondents took active steps in waste management issues, management willingness and interest to commit organizational resources to it was lacking. Even though, individuals saw the need, their attempts were hindered by time and cost pressures.

Another important issue respondents lamented on was the lack of adequate training in waste management within the construction industry. Respondents advocated for periodic training programs on effective waste management practices to equip workers with the requisite skills in the practical reduction of waste. It was also identified from the analysis that, the lack of legal framework, industrial norm or performance standards which leads to waste management being undertaken in an adhoc manner, thereby causing confusion in waste management was a fundamental factor which needs to be addressed by all construction industry practitioners. A good number of respondents also expressed concern about the low levels in waste

technology especially the consequences of waste and how to minimize or reduce it. Respondents therefore expressed great desire for management to ensure the free flow of communication at all levels of company or the organization.

CONCLUSION

The findings suggest that site managers attitudes towards construction waste management was positive, this is because there were attempts by site managers in almost all the study areas to put certain measures to manage waste. However, they advocated for a holistic approach from all (involvement at all levels of site workers and senior management of companies). Their main areas of concern included lack of facilities, and training, knowledge and values in the management of waste. Even though, most site managers were aware of the quantity of waste generated, their efforts to manage waste was constrained by time and cost pressures. The results of the study again suggest that if only construction waste was to be effectively reduced to considerable levels, it will be prudent that construction waste management practices be in co-operated into project goals. Secondly, management should demonstrate greater commitment by providing the necessary facilities and equipment for waste management and control. In addition, there should be legislative instrument providing or establishing performance standards for managing waste. This will provide a baseline or yardstick for all construction companies in the field of waste management.

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