UNIVERSITY OF CAPE COAST

COMPARISON OF WASTE MANAGEMENT PRACTICES OF URBAN AND RURAL BASIC SCHOOL STUDENTS IN HO AND ADAKLU-ANYIGBE DISTRICT IN GHANA

MICHAEL AUGUSTINE ADDU

2010

UNIVERSITY OF CAPE COAST

COMPARISON OF WASTE MANAGEMENT PRACTICES OF URBAN AND RURAL BASIC SCHOOL STUDENTS IN HO AND ADAKLU-ANYIGBE DISTRICT IN GHANA

BY

MICHAEL AUGUSTINE ADDU

Thesis submitted to the Department of Health, Physical Education and Recreation of the Faculty of Education, University of Coast, in partial fulfilment of the requirement for the award of Master of Philosophy Degree in Health Education

JUNE 2010

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature..... Date.....

Name: Michael Augustine Addu

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature..... Date.....

Name: Dr. J. K. Ogah

Co-supervisor's Signature..... Date.....

Name: Mr. F. S. Bediako

ABSTRACT

Waste management practices of urban and rural basic school students in the study area were compared. Generally the study focused on the types of refuse generated, refuse management practices, the re-use of refuse as a waste management practice, human faecal disposal practices, the use of environmental related clubs for health education and waste management as well as student-toilet-ratio in urban and rural basic schools in the study area.

Simple random sampling procedure was used to select190 respondents made up of 98 urban and 92 rural students drawn from 20 schools. Both student respondents and school authorities responded to structured questionnaire on students' waste management practices. A descriptive survey design was adopted for the study.

It was revealed that only 10% urban-based student respondents dispose waste to be carried by non-students while rural-based students do not enjoy the facility. In terms of toilet facilities, 28% urban-based respondents as against 14% rural-based student respondents have no access to toilet facilities in their respective schools. Finally, only 20% urban-based and 30% rural-based schools meet Ghana Education Service requirement of 50 students to one toilet seat.

Based on the strength of the finding, it was concluded that in the light of the abundance of biodegradable waste materials, basic schools could adopt composting as a waste management practice.

ACKNOWLEDGEMENTS

This work would not have been completed without the assistance of some people. Firstly, I acknowledge Dr. J.K. Ogah, my Principal Supervisor and Mr. F.S. Bediako Co-supervisor, both Senior Lecturers of the Department of Health, Physical Education and Recreation, University of Coast, for their guidance, patience and suggestions given through all the phases of my work. This work would not have been completed but for their fatherly supervision.

Secondly, my appreciation goes to Mr. F.S.V. Fiebor and academic staff of Ave Senior High School for their concern and encouragement.

DEDICATION

To my dearest wife, Felicia, with whom I share marriage and Prince and Pious, our lovely sons.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

Background to the Study

Countries all over the world are increasingly recognizing the need to tailor environmental issues in all levels of the socio-economic life. This is because the perceived magnitude of existing environmental problems in any country is gradually being used to determine the level of technological development (Kendie, 1990). Environmental waste management generally is dogged with two main problems: defining and categorising waste and the inadequacy of quantitative information on the amount and composition of waste (Gray, 1997). The latter problem, which is associated with ignorance, predisposes individuals, communities and institutions to the vagaries of mismanaged environmental waste. In sustainable development, quality of life is the goal. It aims at meeting the needs of the present without compromising the life of future generations (Cunningham, Cunningham, & Saigo, 2005). Sustainable development however does not postulate the conservation of nature in its original state as a primary goal. It is rather, a pattern of development that aims at ‘‘minimising (or reversing) the degradation or destruction of the ecological basis of production and habitability’’ (Gallopin, Gutman, & Maletta, 1989, p. 394).

In most developing countries, environmental awareness on sanitation remains a goal, not a reality. The United Nations Organization (UNO) estimates that in developing countries at least 2.5 billion people lack adequate sanitation (Cunningham et al., 2005). This has resulted in an estimated 80% of sickness being attributed to sanitation. Poor environmental sanitation in developing countries is largely due to poor housing and inadequate excreta and garbage disposal facillities (Booth, Martin & Lankester, 2001). In Mexico City, 10,000 tons of garbage generated daily is left as giant pile for flies and rodents to breed on (Cunningham et al., 2005). The continuous quest for modern amenities and the desire to move towards technology and industrilizaton is equally creating environmental problems.

In Ghana, policies and legislations for the control of waste include the Local Government Act, 1980 (Act 462); the Environmental Protection Agency Act, (Act 490); the National Environmental Policy, 1961; and the Environmental Sanitation Policy,1999 (Centre for Democratic Development-Ghana, 2002). Inspite of these, environmental issues still abound: indiscriminate domestic waste disposal and pollution by mining and industrial operations (International Institute for Environmental Development, 1992). A Presidential Report in Parliament in 1995 also revealed that Ghana's environmental problems included waste management resulting from insufficient facilities for waste collection and insanitary practices by the people (Rawlings, 1995). In urban areas and cities in Ghana, solid waste accumulate, block drains and create health problems. A United Nations Development Programme (UNDP) Human Develoment Report ranked Ghana 129th out of 174 developing countries and revealed that 9.5 million of the

estimated 18 million people were without access to good sanitation (UNDP, 1998).

> A study conducted on 11 selected towns in Ghana revealed that:
>
> Only a small fraction of the population has access to acceptable standard of sanitation.The majority either has no domestic toilets or relies on the outmoded bucket technology. In several instances households depend on over loaded public toilets, while others practice open defecation in the bush, paths or the beachfronts. The public toilets are all operating below the minimum acceptable standards, disregarding the fact that the supply capacity is far below the standards for use (Government of Ghana, 1993. p 23).

A study in Greater Accra Metropolitan Assembly also revealed that while toilet sharing among families was limited or non-existing in high-class residential areas, public toilet sharing serving a whole community was a norm in low-income areas (Songsore, 1999).

Though urbanization seems to be associated with good health, urban environments are increasingly being linked with negative health conditions (Atsuko, Takehito, Keiko, & Sachiko, 1996). Industrial activities have brought about uncontrolled air emissions and hazardous affluent waste disposed from industries (Cunningham et al., 2005; Lomborg, 2001). Urban growth in developing countries is increasingly becoming unplanned (Parkinson & Tayler, 2003). The management of solid waste is a major public and environmental concern in urban areas especially in capital cities which are often the gateway to foreign diplomats, businessmen and tourists. Poor visual appearance of cities has negative impact on such communities. Drainage

systems are poor resulting in floodwater becoming contaminated with excreta (Parkinson & Tayler, 2003; Schell & Ulijaszek, 1999; Songsore, 1999). The most polluted places in the world are found in developing countries some of which have particle levels of around 400µg/m^3. This is far in excess of World Health Organization's (WHO) recommended threshold of 50-100µg/m^3 (Lomborg, 2001). Foul-smelling stagnant water has become the breeding ground of mosquitoes (Parkinson & Tayler, 2003; Nordberg, 1999). It was projected that urbanization in developing countries will increase from 35% to 40% by the end of the 21st Century (Nadakavukaren, 1990). Nevertheless, only 35% of urban residents have satisfactory sanitary services (Cunningham et al., 2005). This has implications for waste generation and health.

Despite the establishment of relationship between poor sanitation and incidence of health, sanitation issues have been considered as an urban phenomenon (Kendie, 1990). The problem of waste management is complex and cannot be tackled from one angle Ampomaa (1997). A study on rural sanitation in Ghana revealed that 67% of settlements have no public place for the disposal of household waste while 51% dispose of human excreta indiscriminately (Kendie, 1990). Supply of adequate and accessible potable water is a prerequisite for good hygiene and sanitation (Songsore, 1999).

The rural dimension of environmental waste management cannot be underestimated. This is because urban waste in third world countries is invariably linked with rural migrants who transfer aspects of their village culture to the cities (Nadakavukaren, 1990). The incidence of globalization and the complexity of society do not allow environmental waste issues to be limited to urban and industrial settings. Plastic products, for example, are

becoming popular for packaging food, water and other products because of their durability, inertness, versatility, light weight and resistance to moisture, chemicals and decay (Fobil & Hogarh, 2006; Donnellan, 2000). These packaging materials are most often dumped anywhere at the convenience of the trekking population. Plastics, though not toxic (Crump, 1991), produce undesirable compounds like dioxins (Anspaugh & Ezell, 1995; Crump, 1991). Plastic objects and other products containing oxides of nitrogen and sulphur emit substances that are hazardous to health and the environment when burnt (Agbola, 1993; Crump, 1991). In Ghana, in 1999/2000, plastics constituted 7% -9% of the component materials in the main waste stream (Fobil & Hogarh, 2006). The absence of appropriate plastic management policy in Ghana has created a disgusting visual nuisance in urban and rural areas. This is because there is usually no mechanism that allows proper disposal of these materials (Fobil & Hograh, 2006). While leaves and papers easily degrade in the environment, plastics do not.

Waste materials, whether domestic, industrial or agricultural sources, can no longer be ignored but utilised as a renewable source of energy. Biogas is obtained through anaerobic fermentation of complex organic matter for methane and other gases (Cunningham et al., 2005; Read, Hudgins and 2001). In China, about six million people use biogas for cooking and lighting (Cunningham et al., 2005). Haubenschid Farm in Central Minnesota, United States of America (U.S.A.) uses manure to generate all its power needs with excess for 80 additional homes (Cunningham et al., 2005). In 2001, Haubenschid Farm, for example, saved 35 tons of coal, 1,200 gallons of propane and earned $4,380 from the sale of electric power. Nevertheless,

organic energy wasted every year in the U.S.A. was equivalent to 80 million barrels of oil (Cunningham et al., 2005). Large volumes of waste materials, which could serve as sources of energy and manure resources, have become a source of problem in rural and urban schools and communities in Ghana. The increasing generation of waste has brought about the situation that waste be recycled to make it a resource rather than a problem (Johnson, 1990).

Though waste generation has social dimensions and cannot be avoided in both urban and rural areas, efficient waste management practices can help reduce waste and turn it to be a resource rather than a problem.

Statement of the Problem

In Ghana, the population growth rate of 2.7% (Ghana Statistical Service, (GSS) (2002) and the consequent increase in primary school enrolment has implications for waste generation and management for all educational institutions. Moreover, government policies on basic education such as the Free Compulsory Universal Basic Education (FCUBE), the provision of capitation grant and the school feeding programme are all contributing to the increase in basic school enrolment in recent years. Nevertheless, the provision of corresponding facilities to cater for all forms of waste, including human faecal waste, in urban and rural basic schools is being taken for granted.

The fact is, environmental waste has health implications and poses threat to both the environment and humankind. Thus, information about the types of waste generated and how they are disposed off and subsequently utilized is of concern worthy of investigation in urban and rural basic schools.

Regular surveys and evaluation of waste management practices on a systematic and continuous basis over a period is necessary and can be of considerable assistance. This is normally done in certain urban areas in Ghana but such basic information on urban and rural basic schools is completely lacking in the study area.

What is more, environmental waste generation and management in relation to urban and rural basic schools and antecedents that determine variations or otherwise, in the study area is being taken for granted by education policy makers and administrators. This calls for a study that aims at comparing urban and rural basic school students' waste management practices.

Purpose of the Study

The purpose of this research was to compare waste management practices of basic school students in urban township of Ho and rural Adaklu-Anyigbe District.

Research Questions

1. What are the differences between the types of solid waste generated in urban and rural basic school?
2. How do refuse management practices of students in urban and rural basic schools differ?
3. How different are rural and urban basic school students in terms of waste re-use?
4. Do human faecal waste disposal practices by urban and rural basic school students differ?

5. Does students' membership of environmental/sanitation related club(s) contribute differently to refuse management in urban and rural basic schools?
6. Is the 50 students per toilet seat approved by the Ghana Education Service (G.E.S.) being implemented in urban and rural basic schools?

Research Hypotheses

1. The types of solid waste generated in basic schools in urban and rural communities do differ.
2. In terms of refuse management practices, urban and rural basic school students do differ.
3. In terms of waste re-use, urban and rural basic school students do differ.
4. There is a significant difference between urban and rural basic school students in terms of human faecal waste disposal practices.
5. There is a significant difference between the existences of environmental clubs and the management of refuse by students in urban and rural basic schools.

Significance of the Study

Though educational institutions, the elites and the entire civil society are concerned about the engulfing waste menace, a comparative studies of students' waste management practices in first cycle educational institutions in Ghana is taken for granted. A study on young people's waste management practices is crucial because young people ultimately either play a significant role in contributing to the waste menace or provide solution to the near-future environmental waste issues or both (Bradley, 1980; Eagles & Demare, 1999).

The study exposes education policy makers, administrators and curriculum developers to existing levels of behaviour in waste management in basic schools. This will enable them identify areas for monitoring and improving in urban as well as rural basic schools.

In addition, the study will benefit District/Municipal Directorate of Education, Headmasters/Headmistresses of basic schools as well as parents in their bid to provide holistic education. This is because findings from the study will provide relevant information on waste management facilities in basic schools in the study area. Stakeholders in basic school education will therefore be exposed to variables that are predictors of unsanitary school environment.

Furthermore, the study will provide useful empirical information on rural-urban dimensions of waste management in basic schools. This will form the basis of addressing environmental health needs of students. The study will also supplement earlier works by researchers and governmental agencies like the Environmental Protection Agency (E.P.A.). This is because school based-studies on environmental waste management will provide the needed guidelines that will help address environmental waste issues in schools and their immediate communities.

Lastly, the study will serve as data bank for education policy makers, educational institution researchers, students of research and other stakeholders in education.

Delimitation of the Study

The study focused on waste management of students in basic schools. Specifically, it was concerned with the different types of office and institutional as well as commercial and agricultural waste generation and

disposal. The study also covered human faecal waste disposal facilities. The study was also delimited to basic schools in the Adaklu-Anyigbe District and Ho Town in the Ho Municipality. The rationale is that the rural nature of the Adaklu-Anyigbe District provided responses of students from the rural perspective while the town Ho provided responses from the urban point of view. The basic school was the focus of the study because it lays the foundation for knowledge, attitude and skills needed for future waste management. Respondents to the main questionnaire were delimited to students in the Upper Primary classes five and six and Junior High School (J.H.S.).

Limitations of the Study

One hundred and ninety (190) students and twenty (20) school authorities responded to questionnaire. In spite of the small sample size, a-multistage-approach of probability sampling coupled with the simple random sampling method adopted for sampling the final student respondents, ensured that the sample size was representative of the target population. Although the study aimed at using results and conclusions for urban and rural basic schools in the entire Adaklu-Anyigbe District and Ho Municipality, generalization for regional and national consumption could have been better cherished. In addition, although kindergartens are now incorporated into the primary school system, some are located on separate premises. Some of those located on the same premises have separate faecal management facilities. Generalization of findings could be influenced by these prevailing conditions.

Although efforts were made to sample pupils who are older and capable of responding to the instrument, respondents from primary schools

were young. Nevertheless, efforts were made to reduce the incidence of false responses by explaining the questionnaire in the local language (Ewe) as well as allowing school authorities to respond to issues like the number of toilet facilities

Reliability of the research of 0.63 for the main questionnaire and 0.5 for the supplementary questionnaire for school authorities is rather low. This could influence generalisation of the study. Fraenkel & Wallen (2000) are of the view that questionnaire with reliability of 0.7 or more is better. ties in use: that are susceptible to guess responses by younger students.

Definition of Terms

Basic School: Kindergarten stages one and two, primaries one to six and a three-year J.H.S. Programme in Ghana.

Human Waste: Faeces and urine excretion by humankind that tends to serve no useful purpose where it is found.

Rural Basic School: Basic Schools in communities with settlement less than 5,000 inhabitants. Most residents depend on agriculture and other natural based occupations.

Upper Primary: Primary classes 4, 5 and 6 under the Ghanaian basic school system

Urban Basic School: Basic Schools in settlements with population of 5,000 or more.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The question of environment is a very topical issue. Nevertheless, environmental waste generation and disposal within educational institutions is not extensively researched. The purpose of the study therefore was to compare waste management practices by students in urban and rural basic schools.

The literature has been reviewed under the following headings: Theoretical perspectives of attitude and behaviour; attitude, behaviour and waste management, concept of environment, environmental sanitation and waste management, formal education and environmental health, environmental education and waste management, human waste management and health, human waste disposal facilities, waste management methods, waste management facilities and practices in schools and waste management and the school curricula.

Theoretical Perspectives of Attitudes and Behaviour

Attitude and behaviour are related. Nevertheless, a one-to-one correspondence does not exist between them. Attitudes are dispositions (Zanner & Rempel, 1988) that could be the result of social norms or the desire for social approval (Best & Kahn, 1989). It is something which ‘‘must be perceived by the individual as connected in some meaningful way to a specific situation to serve as a basis for an evaluative reaction in that situation’’

(Prislin & Quellette, 1996, p. 845). One can therefore conceptualise that attitudes cannot be neutral (Sprinthall, Sprinthall, & Oja, 1994). The acquisition of negative or positive feelings (Bordens & Horowitz, 1995), the tendency to react favourably or unfavourably to a class of stimuli determines whether society will classify an individual's attitude to be good or bad. Kundu & Tutoo, (1988) argue that attitude is connected with behaviour. How an individual feels about things like environmental waste determines ones attitude towards it. The cognitive component of attitude (Sprinthall et al., 1994; Wortman, Loftus, & Marshall, 1992) is indicative that thinking and belief shape behaviour and action towards environmental waste. In their knowledge-attitude-behaviour change model, Matthews and Riley (1995) holds that an increase in knowledge will lead to attitudinal change and subsequently influence behaviour. Environmental knowledge and attitude is frequently being used to evaluate the effect of outdoor education programmes on the development of environmental responsibilities (Matthews & Riley, 1995).

The Consistency Theory of Attitude however identifies three components of attitude: cognitive, emotional and behaviours (Wortman et al., 1992). Each of the components in the theory; thinking and developing belief, feelings and eventually take action respectively is consistent with one another. Behaviour change is therefore a process: people move through several intermediate stages before they change their behaviour (Piotrow, Kincaid, Rimon & Rinehart, 1997). Piotrow and Associates in their Steps to Behaviour Change model identified five hierarchical steps to behaviour change. These are Knowledge, Approval, Intention, Practice and Advocacy (KAIPA). The

Approval and Intention stages of the model are synonymous with the emotional component of the Consistency Theory of Attitude model. *The theory of planned behaviour* reviewed the ability of attitude to predict intentions and overt behaviour (Schmidt, 2007). It holds that people act in accordance with their intentions, while intentions themselves are influenced by attitudes towards behaviour (Azen, 2001). Attitudes acquired through personal exposure are likely to be held strongly and affect human behaviour (Davison, Yantis, Norwood & Montano, 1985). Advocacy for behaviour change cements earlier conviction, sustains new behaviour, helps others to adopt acceptable behavioural trends and provide positive feedback to the process of behaviour change (Piotrow et al., 1997). The attitude and behaviour of students can be effectively altered through education (Schmidt, 2007). There is therefore the need for environmental education in the realm of mainstream education.

Attitude, Behaviour and Waste Management

Improvement in waste management attitudes and practices require a series of effective community environmental programmes. Such education initiatives must be designed to improve upon knowledge, attitude and waste behaviour of citizens (Grodzinska-Jurczak, 2001). In addition, the establishment of the prior knowledge of a specific age group (Caneer, 1997; Palmer, 1995) as well as the attitude and behaviour intention (Ballantyne, 1998; Ballantyne & Pucker, 1996) of target audience is of vital importance in environmental waste management.

A study in five communities in Cape Coast on the degradation of the beach revealed that males show positive attitude than females while older

people also showed more positive attitude than younger ones towards environmental degradation (Kotey, 1998). Fact is, behaviour is not always a true indication of attitude (Best & Kahn, 1989). Kotey (1998) indicated that findings on attitude towards degradation of the beach differ from what was on the ground. Thus, what people say their attitudes are, and what their attitudes really are, may not be the same. Nevertheless, in attitude data, statements that respondents agree on or disagree with, serve as a guiding force that affects the choice he or she makes every day.

Concept of Environment

Although the term *environment* does not have a watertight definition, all approaches can be traced to the welfare of humanity. The term is generally used to depict the traditions and influences under which any individual or living thing lives and develops (Gilpin, 1980). This presupposes that the human environment is composed of the abiotic factors of land, water, atmosphere, odour and the biotic factors like man, flora and fauna. It also includes social factors that are made up of culture and quality of life (Gupsta, 2006; Gilpin, 1980). The environment is also being viewed as an assembly of people and things which render a stream of services or disservices to the individual (Gilpin, 1980).Thus, the environment is generally seen as the sum total of conditions which surround humankind at a given point in time and space (Obeng, 1980; Park, 1980).

These definitions of the environment identify surroundings as a combination of physical and socio-cultural conditions or intrinsic social values that affect and influence the growth and development of individuals or a community (Obeng, 1980; Gilpin, 1980). One can equally identify three

functions of the external environment: a bank of resources for consumption, life supporting system for humankind and other living things and a sink for waste (Harrison, 1983). Though the environment serves as a sink for wastes, the extent to which waste is managed or mismanaged will determine the efficiency of the other functions of the environment. Thus, it is man who ultimately defines environment.

Environmental Sanitation and Waste Management

One of the vital areas of concern for public health is sanitation. It involves the removal and disposal of all waste matter, whether liquid or solid (Gilpin, 1980). Gupsta (2006) cites the World Health Organization's (WHO) reference to Environmental Sanitation as the science of safeguarding health. The WHO thus defines environmental sanitation as ''the control of all those factors in man's physical environment which exercises or may exercise a deleterious effect on physical development, health and survival'' (Gupsta, 2006, p. 123). Sanitation therefore deals with drainage and sewerage, sewage and sullage treatment as well as affluent disposal and safe domestic water supply to ensure public health (Gilpin, 1980; Bradley, 1980). The existence of hygienic conditions is therefore of primary concern for sanitarians. Thus, the removal of public nuisance in the form of domestic and industrial liquids, solid wastes like garbage, ashes, rubbish as well as street sweepings and leaves (Pickford, 1980) are vital to sanitation.

Waste substance therefore is an unwanted solid and or liquid material that has served its originally intended purpose and is being discarded or stored prior to being discarded (Gupsta, 2006; Williams & Langley, 2001). Such substances are usually drawn from households, streets, institutions and

commercial establishment and industries. The management of waste thus involves the collecting, transporting, processing and recycling or disposal of waste materials usually produced by human activities (Pickford, 1980). Waste management is carried out to reduce the materials effect of waste on the environment and recover resources. In addition, these management practices are undertaken to reduce the effects of environmental waste on health, aesthetics and amenities (Obeng, 1980). The deterioration of the environment therefore affects people's health and socially. In spite of these effects, people live with decaying and stinking refuse in 'public drains' in front of their homes and even turn where their children attend school to become stagnant pool of refuse and excreta dump. The deterioration of human sense of good taste and cleanliness calls for the regard of sanitation as a public good (World Bank, 1992) that has health benefits.

Formal Education and Environmental Health

The British Medical Association (B. M. A.) defines the term environmental health. as "those aspects of human health including quality of life, that are determined by physical, biological, social and psycho-social factors in the environment''. It also refers to the ''theory and practice of assessing, correcting controlling and preventing those factors in the environment that can potentially affect adversely the health of present and future generation" (B. M. A.,1998, p.148). The definition thus portrays the multi-dimensional nature of health. This calls for an inter-sectorial approach to handling health and environmental issues. Environmental variables that can influence health are varied. They include water supply, excreta disposal, surface water management and garbage disposal (Booth, Martin, and

Lankester, 2001). The extent to which waste is managed in basic schools has a bearing on environmental health.

Education and for that matter formal education is seen as a critical factor for the alleviation of ignorance, fear, and servility. Formal education therefore assumes the roles of the 'critical factor' capable of removing all forms of factors in the environment that can adversely affect the health of the present and future generations (Solstad, 1981). A study on the relevance of the curriculum in rural Norway, revealed that the educational system in operation directs young people away form their own communities (Solstad, 1981). Such a situation is likely to have adverse effect on the area. It however becomes equally disturbing when a research finding in Poland showed that children and young people generally have limited knowledge about the environment. Even where such pieces of information are factual, they are not systematized; resulting in inability to attribute causes to effect in day-to-day application (Grodzinska-Jurczak, Bartosiewicz, Twardowska & Ballantyne, 2003).

Grodzinska-Jurczak and associates (2003) undertook a study among primary school pupils (aged 11-13 years) in Krakow, Poland, to evaluate the impact of school waste education programme. It was revealed that environmental knowledge does not necessarily lead to improved practice (Grodzinka-Jurczak et al., 2003). This confirms earlier studies by Tikka and associates (2000). Grodzinska-Jurczak and associates (2003) further revealed low 'knowledge index' of the respondents. Six out of 284 pupils (2.1%) responded accurately to all the questions. Although 98% of municipal waste in Poland is disposed off in landfills, only 56.7% of respondents could identify

this common disposal method. Scores on the 'behaviour index' was equally low; only 15 pupils (5.3%) achieved the highest score while 190 pupils (66.9%) scored zero. The researchers cites the unwillingness to make sacrifice on environmental waste due to inconveniences such as inadequate waste bins, irregular waste removal, insufficient recyclable depots and scarcity of educational programmes (Grodzinska-Jurczak et al., 2003). Similar studies in Nigeria involving Grade five pupils (Kola-Olusanya and Ahove, n d) and an environmental attitude test on grade three pupils and two years later (at grade five) (Jaus, 1997) revealed an improvement in attitude towards solid waste disposal when pre-test and post-test were compared. A related study among undergraduate university students to discover the impact of an Environmental Education course (ENV. 201) on students' attitude and behaviour revealed that students who enrolled in a course on Environmental Issues showed high level of environmental awareness and consciousness while students who did not enrol in the course demonstrated overall lower levels of environmental awareness (Schmidt, 2007). The extent to which environmental waste is managed or mismanaged by students is determined by the level of environmental awareness. This is because there is increase correlation between environmentally conscious attitude and behaviour as a function of course participation (Schmidt, 2007).

The state of environmental waste generation and disposal in basic schools in the Township of Ho and the Adaklu- Anyigbe district become uncertain in the light of these findings.

Environmental Education and Waste Management

Environmental problems in developing countries arise due to poverty, inadequate socio-economic development and high level of material consumption (Gallopin et al. 1989). These factors become operational in the light of high levels of ignorance. Formal education over the years has served as the catalyst for awareness creation and subsequent environmental change in communities (Grodzinska- Jurezak et al., 2003).

Environmental Education is concern with ‘‘understanding the skills and attitudes necessary for enhancing environmental conservation’’ (Otiende, Ezaza, & Boisvert, 1997). This process enables individual to understand and appreciate the biophysical environment so that a sense of responsibility will lead to valuing and protecting the environment from destruction. A learning process increases people’s knowledge and awareness about the environment. It also exposes associated challenges and provides the necessary attitudes, motivations, skills and expertise needed for the individual to make informed and responsible decision (UNESCO, 1978). Environmental Education is not ‘’merely a strategy for creating awareness of the environment, but also a means towards developing positive concern for maintaining the quality of our life on earth’’ (Otiende, et al., 1997, p.16). Since environmental problems have now become a social process, awareness creation is vital in issues relating to waste management. The United Nations Conference on Human Environment, held in Stockholm recommended the establishment of:

> ...an international programme on the environmental education interdisciplinary in approach, in schools and out-of-school, encompassing all levels of education and directed towards the general

> public, in particular the ordinary citizen living in rural and urban areas, youth and adults alike, with a view to educating people as to simple steps they might take within their means to manage and control their environment (Bandara, 1989, p. 441).

In Ghana, though there have been much discussions on the rationale and goals of environmental education (E.P.C., 1992), such awareness creation remains a goal rather than a reality. Limited efforts have been made to involve basic schools in waste management. Otiende and associates (1997) cited the UNESCO-UNEP International Environmental Workshop, the Belgrade Charter of 1975, which sees the goals of environmental education as involving the fostering of socio-economic, political and ecological awareness in both urban and rural areas, such that the individual acquire skills to create new patterns of behaviour towards the environment (Otiende et al., 1997).

The subject of attitude is a core issue concerning environmental education especially in developing counties where negative disposition to the environment and for that matter waste management, is predominant (Ahove, 2000). Environmental education must therefore aim at incorporating many aspects of the environment: natural and fabricated, technological, socio-cultural and the aesthetic values (Ramsey, Hungerford & Volk, 1992).

An urban community–based waste management case study in Nairobi cites the Mathare Youth Sports Association that uses sports (football) as a motivation factor to promote community responsibility. It uses clean ups: collection of garbage, removing and clearing drainage ditches with the help of the Nairobi City Council (N.C.C.) personnel and equipment (Peters, 1998). Usually, ‘‘local governments and NGOs rarely seek to meet the needs of

children, nor do they involve them in environmental action which will bring them direct benefits'' (Munro, 1992, p. 207).

It is of great importance to educate children about the environment because they are ''less likely to have well established environmentally harmful behaviours to unlearn'' (Leeming, 1997, p. 33). Environmental education therefore affords students the opportunity to effectively manage rather than mismanage waste. This is because every society tends to educate the young generation by passing down socio-cultural attributes that may or may not be environmentally friendly. Children are the ideal target in environmental education because they retain new information better than adults retain and therefore constitute the vehicle for change in the future (Flynn, Berry, Saker, Kavanaugh & Currie, 2002). Waste education programmes in schools provide the avenue through which the individual is prepared to be responsive to the rapidly changing technological world and understand contemporary issues and problems. Children also serve as an effective agent that can be used to promote environmentally responsible behaviour in others (Leeming, 1997). Environmental education in a peer-oriented setting gives a sense of ownership and stewardship (Flynn et al., 2002) in the management of the environment and for that matter, all forms of waste. Environmental education, especially among children and the youth will help bridge the gap of separateness and disconnectedness from nature, which is the root cause of environmental problems.

Modernity has made televisions, the internet and computer games to keep children from the realities of the environment. The socio-cultural dimensions of environmental issues calls for an effective environmental

education at all level to help reduce and manage waste.

Waste Management and Health

Primary Health Care (PHC) aims at the provision of preventive, curative and rehabilitative services (Phillips, 1990). PHC therefore focuses on basic sanitation. Sustainable environmental sanitation cannot be attained without corresponding effective waste management practices. Nevertheless, in developing countries waste is disposed off by irregular dumping by simply dropping in the open (Cunningham et al., 2005). Cities, towns and villages have giant piles of waste scattered and left to the mercy of the wind, rain, rats and flies. Rubbish dumps have become the breeding grounds of pests (Schell & Ulijaszek, 1999). This has resulted in both urban and rural dwellers suffering from excessive exposure to disease transmitted by insects and rodents. The consequence of waste mismanagement was exposed in a study in Accra. The study revealed that toilet sharing, accumulation of garbage, choked drains and stagnant water was common in low class areas (Songsore, 1999). Insect vectors like flies, mosquitoes, cockroaches as well as rodents abound in these areas. Although urbanization has been associated with civilization and good health, negative health conditions persist especially in cities in developing countries (Atsuko et al., 1996). Students/pupils in urban basic schools could not be ruled out of the health implications of waste mismanagement.

The tropical climate in Ghana, with its abundant rainfall and humid atmosphere, predisposes waste to fast decay (Mckenzie & Pinger, 1997). The humid condition as well as about 70% vegetable matter content of waste (Armah, 1992) creates conducive environment for pathogenic organisms to

thrive (Pickford, 1995; Armah, 1992). The improper disposal of wastewater in schools can bring about the stagnation of water in drains and shallow places. This becomes the breeding ground of mosquitoes and subsequent malaria infection (World Bank, 1994; Bradley, 1980). Indeed, 13 out of the 36 significant diseases reported in the Accra Metropolitan Assembly can be linked to poor sanitation-including stagnant water and inadequate facilities for waste disposal especially in high density and low-income areas (World Bank, 1994). It is also evident that children, (including school going children) are more prone to malaria infection than adults, it is equally possible some could get these diseases from poorly managed waste in the school system.

The disposal of electronic waste (e-wastes) like computers, cell phones, television sets and printers is an emerging environmental issue (Cunningham et al., 2005; Huo et al., 2007). E-wastes have become the most rapidly growing segment of the municipal waste stream. It is reported that about 500 million computers became obsolete between 1997 and 2007 in the U.S.A. (Cunningham et al., 2005; National Safety Council, 1999). The U.S.A. is also the only developed country that has not ratified the United Nation Basel Convention that banned the export of hazardous waste to developing countries (Cunningham et al., 2005; UNEP, 2006; U.S. Today, 2002). As a result, up to 80% e-waste has seeped into Africa and Asia (Johnson, 2006; Puckett et al., 2002)

Hazardous chemicals can be released from e-wastes through disposal or recycling- threatening the health of local residents (Huo et al., 2007). Lead is one of the most widely used toxic heavy metals in electronic devices (Musson et al., 2006; Jang & Townsend, 2003). Children are more vulnerable

to lead poisoning because they absorb it from the environment (Grigg, 2004). Though the U.S.A. Centre for Disease Control and Prevention (C.D.C.) defines elevated blood lead level (BLL) as those ≤10µg/dl in children ≤ six years (C .D.C., 1991), studies indicate that low blood lead concentration even < 10µg/dl were associated with children's IQ scores and academic skills (Schnass et al., 2006; Canfield et al., 2003; Nevin, 2000). Such students do not concentrate well and are restless (Lomborg, 2001). A study among children in Guiya, an e-waste recycling town in China revealed that 81.8% of the 167 sampled children had BLL > 10µg/dl (Huo et al., 2007). The study also revealed a significant increasing trend in BLLs with increase in age.

Educational institutions including basic schools in Ghana continue to benefit from electronic devices from developed countries. The disposal of e-waste materials in basic schools and the scramble for all forms of scrubs for sale and the indiscriminate burning of almost all forms of solid waste, have health implications for the young.

Human Waste Management and Health

The increasing human population in developing countries coupled with inadequacies in human waste disposal facilities, has resulted in the population being engulfed with waste leading to diseases. This situation cannot be underestimated in basic schools when viewed in line with recommended toilet fixture ratio. In Ghana, the GES recommended toilet fixture for basic schools is a toilet hole for every fifty students/pupils (1:50). Inadequacies in human waste management facilities in terms of number, design and location of toilets have implications on the health of children.

There are a number of health related diseases associated with unhygienic disposal of human waste. These include:

1. Bacterial infections like typhoid, cholera, bacillary dysentery, diarrhoea and gas-enteritis.
2. Viral disease like infectious hepatitis, poliomyelitis and miscellaneous diarrhoea.
3. Protozoa infections like amoebic dysentery.
4. Helminthic (worms) infections like roundworm (ascariasis), bilhazia (schistosomiasis) and hookworm (Nordberg, 1999; Bradely, 1980).

It is evident from the foregone that children in basic schools where toilet facilities are inadequate and unhygienic are likely to be exposed to a number of otherwise preventable diseases. The school will thus become a centre of dissemination of a number of infectious diseases if proper waste management practices are not adopted. It is estimated that over 50 diseases are linked with inadequate sanitation including improper human waste disposal (Cunningham et al., 2005; Nordberg, 1999).

In Ghana, the inadequacy and possible health consequences that improper human waste disposal is likely to bring about was revealed in study in Accra where four percent (4%) of residents have no access to toilet (Songsore, 1999). A Related study in two poor African suburbs in Cape Town, Nyanga and Khayelitsha, also revealed that 30% of residents had difficulty in accessing community toilet while 10% had no access to toilet (De Swardt, Puoane, Chopra, & Du Toit, 2005)). Under such conditions the use of the free-range and the conventional pit latrine, common in most developing countries, becomes the alternative (Duncun, 1996). This system

of human excreta disposal it highly unhygienic. This is because it exposes the waste to flies, which are very likely to carry eggs of intestinal worms from excreted human stool –where the fly starts its meal -to human food (Nordberg, 1999). The ever-increasing enrolment in both urban and rural basic school has implications for health.

Human Faecal Waste Disposal Facilities

In developing countries and for that matter Ghana, excreta disposal remains a serious problem. In Ghana, coverage of household human waste facilities (latrine) is currently low (Larbi, 2006). The 2000 Population and Housing Census revealed that only 41.5% of households have toilet facility provided in and around the house, 21% of households use Pit toilet, 6.8% use KVIP toilet, 8.6% use Water Closets (WCs) 4.1% use bucket pan, 31% use public facility and 20.2% had access to no specialised toilet facility (GSS, 2002). Governments tend to neglect rural areas in the provision of human waste disposal facilities (Larbi, 2006). There is however structural decay of the few excreta disposal systems that were in existence (Oluwande, 1996; Duncan, 1996). In most cases, the technology that is available for the disposal of human faeces is that which was available to primitive people (Oluwande, 1996).

Open Disposal of Human Faecal Waste (free range)

One of the oldest forms of human excreta disposal is the act of defecating in the open. This practice is still a norm in many Ghanaian rural and even peri-urban communities (Songsore, 1999). A study in Tanzania that revealed why peasants defecate indiscriminately instead of build and use pit latrines. The study identified lack of education, restrictive tradition and

sitting of latrines in poor soils without consulting the people (Rybczynski, Polprasert & McGarry 1978). Children are discouraged from using caved-in, smelly, fly infested and unclean pit latrines (Burras, Patel & Kerr, 2003; Rybczynski et al., 1978). The Society for the Promotion of Area Resource Centre (SPARC), an NGO, undertook a project in rural India aimed at designing and managing toilets. It reported, "Children were encouraged to defecate in the open," because they feared to use conventional toilets, which were dark, smelly and had deep and long pits. The children also, usually lose out to adults when they queue for the use of the public toilets (Burras, et al., 2003). The survey report further revealed that though adults of both sexes use the open as an alternative, females suffer most since they have to protect their modesty: wait until nightfalls. Inadequate or poorly maintained communal toilet facilities encourage open defecation (McGarry, 1980). A study on Health implications of water utilization in Cape Coast cited uncompleted structures and school compounds as areas where open defecation was done (Nkrumah, 2003).

Alternatively, people use hoes and cutlasses to dig shallow holes into which they defecate (Burras, et al. 2003). The practice of indiscriminate defecation is unsightly, pollutes drinking water as well as course sporadic outbreak of diseases like cholera and dysentery (Duncan, 1996). Nkrumah (2003) recommended that to reduce the contamination of drinking water, the Kumasi Ventilated Improved Toilet (KVIP) toilet facility rather than the free-range and pit latrine be used.

Though the free–range disposal of human faeces may not be the norm in basic schools in the study area, students are likely to resort to this

alternative if existing facilities are inadequate and more so if schools are cited near a bush. This will invariably expose students to possible risk.

On-Site Disposal latrine system

The latrine system of human waste disposal is an improvement on the use of dug shallow hole for each attendance. The system is the most widely used technology for excreta disposal in the tropics (Rybczynski et al., 1978): though it takes second place to indiscriminate defecation in the field in many developing countries. A conventional pit latrine is composed of a hole in the ground (the pit), a squatting or standing plate and sometimes an enclosure for protection and privacy (Wood, De Glanville & Vanghan, 1997; Duncan, 1996). The pit latrine is meant to deposit faeces out of the reach of the fingers, feet and flies (Wood et al., 1997). For safety and hygienic purposes, it is recommended that the latrine is 15 meters to 30 meters away from the house, the source of water and be on a dry ground where water drains away (Wood et al., 1997). The pit must be 3.5 meters to 5 meters deep (Wood et al., 1997; Oluwande, 1996). A deep pit, being dark inside, reduces the breeding of flies (Oluwande, 1996), takes a longer time to fill and also reduces smelly conditions. Other types of the pit latrine include the borehole and the trench latrine (Wood, et al., 1997).

It is recommended that areas with weak and porous soil should have the inner walls of the pit lined with wooden or bamboo stakes and the floor reinforced with concrete slabs (Oluwande, 1996). Rybczynski and Associates (1978) cites an urban pit latrine project in Botswana with improved structures such as sturdier construction, reinforcement of pits, use of ventilated pipes and provision of covers for holes. In the light of scarce

resource to build affordable and standard toilet for all educational institutions, the latrine facility could still be used in rural basic schools given specifications and technical directives.

The bucket system of excreta disposal involves the collection and disposal of human excreta manually (Gupta, 2006). Buckets are placed under raised platform for users to sit or squat on to discharge faeces into them (Duncan, 1996). The content is emptied manually into pits or trenches (Duncan, 1996; Wood et al., 1997). The practice is by far the most crude, primitive, unhygienic (Duncan,1996; Rybczynski, et al., 1978) and against human dignity (Duncan,1996). This is because the practice is associated with infrequent collection, objectionable smell, soil and water pollution and increase rate of infectious and preventable diseases (Gupta, 2006; De Swardt, et al., 2005; Songsore, 1999; Rybczynski et al., 1978).

Though the use of the bucket latrines were banned in Ghana a decade ago, it was yet to be eliminated (Larbi, 2006). A study in Accra revealed that 21% of residents use bucket latrines, 41% use pit latrines whiles four percent (04%) have no access to toilet facilities (Songsore, 1999). A similar study in two poor African suburbs in Cape Town -Khayelisha and Nyanga also revealed that 10% of residents had no access to toilet, 11% use bucket latrine, 13% use pit latrine and 30% had difficulty in accessing community toilet (De Swardt et al., 2005). A study on the state of rural sanitation in Ghana indicated that 51% of 490 settlements sampled dispose human excreta indiscriminately, 48% use pit latrine while 67% had no public place for disposing household waste (Kendie, 1990). These findings have implications for waste disposal practices in both rural and urban basic

schools. A survey by Ghana Demography and Health Survey (GDHS) however revealed that 7.2% urban dwellers as compared to 35.4% rural settlers have no toilet and therefore defecate in the bush/field. The survey also revealed marked differences between urban and rural settlements in terms of efficient and hygienic method of human waste disposal. While 18% of urban dwellers used improved toilet facilities that were not shared, only 8% of rural dwellers enjoy the same facility (GSS, 2009).

An improved form of the conservancy system involves emptying cesspools either manually by hand buckets or by pumps into purpose made mobile closed tanks (Duncan, 1996). The cesspools are usually covered with tanks built with concrete blocks below ground level.

Compost Pit Latrines

Though physical, chemical and biological processes are involved in the decomposition of solid waste, the biological processes are significant and able to control largely the physical and chemical processes (Read et al., 2001). The construction of a pit latrine to serve a dual purpose of a toilet and manure involves constructing the latrine such that human excreta, leaves, and other organic household wastes are dumped into the pit latrine to decompose (Wood et al., 1997) and converted into useable fertilizer. The procedure involves digging two shallow pit latrines that are used alternatively. A filled up pit is closed for four to six months to enable it decompose and dry. The resultant dry odourless substance, free from pathogenic bacteria (Rybczynski et al., 1978), is crumbled and used as manure (Oluwande, 1996; Wood et al., 1997). In Ghana only 0.1% of 44,080

people sampled in a survey by Ghana Demographic and Health Survey (GDHS) use composting toilet (GSS, 2009).

An efficient composting requires a balance between carbon and nitrogen (Rybczynski et al., 1978). The addition of cellulose materials in the form of leaves and grasses reduce excess nitrogen content in excreta due to urine input. Furthermore, the incorporation of kitchen ash absorbs moisture, neutralises bad odour normally associated with anaerobic composting. It also destroys intestinal worm ova (Rybczynski et al., 1978). The practice of composting excreta produces nutrient-rich amendment that helps in the retention of soil water, slows down erosion and improves crop yield (Cunningham et al., 2005). The practice also destroys about 85% worm ova and converts 98% organic nitrogen to useful organic forms within two months of composting (Rybczynki et al., 1978).

The introduction of compost pit latrines in rural basic schools and the subsequent use of the generated manure will go a long way to inculcate the practice not only in students but also disseminate the technology to the larger community. This process of recycling human faeces biologically also has the potential of generating waste gas which can be captured and used in rural households (Oluwande, 1996) as fuel and electricity.

Ventilation Improved Pit (VIP) Latrine

The VIP latrine apart from having features of a pit latrine also has screened external vent pipe. The vent pipe is at least 75mm in diameter, painted black and located at the sunny side of the latrine (Duncan, 1996). This additional innovation prevent flies from breeding in the pit because they are unable to escape through the sunny vent. The black paint on the external vent

pipe also absorbs heat and causes heat and odour in the pit to be expelled thorough the vent pipe (Duncan, 1996). The process leaves the squatting floor with minimal odour. In Ghana, the VIP latrine device is called KVIP latrine. DANIDA sponsors the building of KVIPs in public basic schools. The Parent Teachers Association (P.T.A) is however required to contribute five percent of the capital cost (Larbi, 2006). The trend, if sustained with no financial conditionality on parents, will help address faecal waste disposal in school.

The Reid's Odourless Earth Closet (ROEC) design of the VIP latrine however has the pit off set. Excreta are introduced into a pit via a slopping chute (Duncan, 1996; Rybczynski et al., 1978)). The device nevertheless has a problem of periodic choking of the chute. The 'water-seal 'or' pour-flush design of the ROEC requires the provision of a simple water seal (Rybczynski et al., 1978; Duncan, 1996), about one or two litters of water, to be poured by hand to flush the excreta into the pit. The system is suitable for Moslem communities and areas where water is used for anal cleansing (Duncan, 1996). The design prevents the breeding of mosquitoes and also reduces odour.

Aqua Privy Toilet

The aqua privy design of toilet facility consist of septic tank(s) which discharges its affluent into an adjacent soakage pit, a squatting plate with a drop pipe (100mm-150mm in diameter and 10cm-15cm at the bottom band below the water level in the tank) and a simple water seal between the squatting plate and the water tight tank content (Duncan, 1996). It usually has vent pipe as well as a superstructure for privacy. The toilet user is however required to add sufficient water to the tank through the drop pipe. The water seal and the watertight nature of the design help prevent flies and reduce odour

in the facility. The system must be kept hygienically clean. Improperly installed septic tanks can be a source of health hazards.

Although some degree of faecal Coli form is usually accepted, high traces are indication of public health hazard (Duncan, 1996; Hodgson, Larmie & 1999).

The aqua privy device of toilet is suitable in schools where there is adequate water but the supply system is not linked with excreta disposal facilities. There is equally the need for effective supervision to enable teaching and non-teaching staff as well as elderly students to use it hygienically.

Waste Management Methods

Open Dump

The open dump system of waste disposal involves the dumping of waste irregularly anywhere (Cunningham et al. 2005). Though illegal, it is one of the common practices in developing countries. Open dumping of waste is also associated with burning aimed at condensing the material (Anspaugh & Ezel, 1995). In the short term, open dumping is cheap and can be used to fill low-lying land for future use (Gupta, 2006).

Nevertheless, open dumping of waste produces leachates (Cunningham et al., 2005) which removes soluble constituents from the waste and subsequently percolates into the soil leading to the pollution of groundwater (Cunningham et al., 2005). Furthermore, open dumping favours the breeding of large proportion of flies, rodents and vermin (Anspaugh & Ezel, 1995). Insanitary conditions created by indiscriminate dumping of waste have health implication. In addition, open dumping has resulted in the emergence of piles of refuse in cities, town, villages, along roads and virtually

any vacant place (Cunningham et al., 2005). The practice therefore reduces the value of adjacent property (Gupta, 2006) because of bad odour produced especially during the rainy season. Open dumps and burning create health hazards. It is therefore not an acceptable method of solid waste disposal (Essumang, 2000).

In Ghana, only 16.5% of households have means of burying and burning solid waste while 82.6% of households use either public dumpsite or at any convenient place like steams, gutters or undeveloped plots of land (GSS, 2002). Sixty-seven percent (67%) of rural settlements have no public place for the disposal of household waste (Kendie, 1990). These findings have implications for solid disposal in basic schools.

Incineration of Waste

The process of incineration of waste involves reducing waste materials to ashes, heat, gas and steam by combusting (Open University, 1993).

The process is capable of reducing waste to about 10% its initial volume (Armah, 1992; Gray, 1997) and 20% of original weight (Mckenzie & Pinger, 1997). In the light of the phenomenal increase in the generation of environmental waste, incineration has gone a long way to solve the problem of scarcity of land and the disposal of infectious waste materials like hospital wastes (Gupta, 2006). It is estimated that the Netherlands and Japan incinerate about 50% and 75% of municipal waste respectively (Gray, 1997). Heat derived from incinerated refuse is processed into steam and or for the generation of electricity (Cunningham et al., 2005; Mckenzie & Pinger, 1997; Johnson, 1990), for domestic and small-scale industrial use.

Residual ash and 'unburnable' residues, which may be toxic, are usually sent to landfills for disposal (Cunningham et al., 2005; Mckenzie & Pinger, 1997), or disposed anyhow. The acidic nature of the residual by-products of incineration could dissolve soluble compounds, hydrolyse materials and infiltrate into local groundwater (Read et al., 2001; Mckenzie & Pinger, 1997). Though many modern incinerators use filters to reduce harmful emissions, toxic substances are not entirely eliminated (Mckenzie & Pinger, 1997). Hazardous substances like mercury, lead and cadmium (Johnson, 1990) are released into the atmosphere. Oxides of nitrogen and sulphur, which are associated with acid rains, are also emitted during incineration (Armah, 1992).

Though plastics are not toxic by themselves, when burnt, they generate undesirable compounds like dioxins (Crumps, 1991; C.D.I.S., 1990). Furthermore, Polychlorinated biphenyls (PCBs) also generate dioxins when partially incinerated. Plastic objects and other products containing oxides of nitrogen and sulphur emit substances that are hazardous to health and the environment when burnt (Agbola, 1993; Crump, 1991). In Ghana, in 1999/2000, plastics constituted 7% -9% of the component materials in the main waste stream (Fobil & Hogarh, 2006). The absence of appropriate plastic management policy in Ghana has created a disgusting visual nuisance in urban and rural areas. This is because there is usually no mechanism that allows proper disposal of these materials (Fobil & Hograh, 2006). While leaves and papers easily degrade in the environment, plastics do not. It is estimated that the emission of dioxins from municipal incinerators cause 250 deaths per a million population in 70 years (Cunningham et al., 2005). Nevertheless, high

temperature of about 1200^{o}C can destroy both dioxins and PCBs (Crumps, 1991).

Despite the fact that incinerators, especially those of high technology and temperature are expensive (Cunningham et al., 2005; Mckenzie & Pinger, 1997; Gray, 1997; Armah, 1992), and cannot be afforded by basic schools, community incinerators could be used. Separation of waste at the point of generation rather than mixed waste processing (Newell, 1990) will go a long way to reduce the health and environmental risks associated with indiscriminate burning of waste.

Sanitary Landfills

A Sanitary Landfill is also referred to as controlled tipping (Gupta, 2006; Open University, 1993). The sitting of a sanitary landfill is predetermined by the geographical location, geological composition and climate of the place (Anspaugh et al., 1995). Sites for landfills are therefore specially selected to avoid leachates from reaching groundwater. Normally a clayey site is preferred (Cunningham et al., 2005; Nadakavukaren, 1990). Globally, landfills remain the most commonly used and often the cheapest method for municipal waste disposal (Read et al., 2001; Gray, 1997)).

In Ghana, the traditional way for reclaiming low-lying land is to use them as waste disposal sites (Armah, 1992). However, older landfills and those in developing countries are of poor standard and a significant environmental risk because of anaerobic degradation of waste (Read, et al., 2001). Read and Associates (2001) cites Smith and associates (1998):

> Landfills worldwide are seeking sustainable solid waste management approaches as well as remediation technologies that are timely. We

> believe an aerobic landfill approach can, in many cases, accomplish both. This technology not only can provide the possibility for a ‘‘perpetual landfill’’ (accelerated waste stabilisation combined with landfill mining), but could also address many of the environmental concerns associated with MSW landfills (eg. groundwater impact, ‘‘greenhouse gases’’). From a life cycle analysis, this approach could yield significant cost saving and greatly reduce environmental liabilities (Read et al., 2001, p. 244).

Anaerobic decomposition of waste materials at landfills produces flammable gases instead of carbon dioxide (Cunningham et al., 2005) and explosive, odourless methane (CH_4) as well as vapour-phase Volatile Organic Compounds (VOCs) and CO_2 (Cunningham et al., 2005; Read, et al., 2001) called ‘greenhouse gas’. It is estimated that about 60% of waste buried at landfills is organic in content and degrade through fermentation under anaerobic condition (Read et al., 2001). Aerobic decomposition (oxygen using) involves composting of readily and moderately degradable solid waste constituents (Cunningham et al., 2005; Reads, 2001; Duncan, 1996). During the process of aerobic decomposition, respiring bacteria convert biodegradable masses of waste and other organic wastes to Carbon dioxide and water instead of methane (Read et al., 2001). The process leaves stable humus. The recirculation of the waste’s leachates improves the degradation process as microorganisms indigenous to the waste use the moisture and nutrient (Read et al., 2001).

Modern landfills are designed to contain leachates by laying them with clay or plastic materials (Cunningham et al., 2005). Wastes are tipped in

layers, covered with earth and compacted to increase its density and stability (Cunningham et al., 2005; Open University, 1993). In principle, no waste is expected to be left uncovered for more than twenty-four hours (Open University, 1993). The use of sanitary landfills is likely to play a much-reduced role in waste management strategies due to recent policy initiatives at international, national and local levels aimed at discouraging landfills and promoting alternative methods (Gray, 1997). The European Union (EU) waste management hierarchy identifies minimizing waste, reuse; recycling, recovery energy and landfill use (Gray, 1997).

Sanitary landfills are associated with periodic contamination of surface and groundwater by the leachetes (Mckenzie & Pinger, 1997; Gray, 1997). The amount of moisture present in organic and inorganic rubbish at the time of placement as well as high concentration of heavy metals, ammonia, toxic organic compounds and pathogens determine the level of toxicity of laechate (Gray, 1997). Sanitary landfills are also associated with periodic explosion, scarcity of appropriate terrain and the loss of property value within the vicinity of landfills (Cunningham et al., 2005). This is due to the fear usually associated with living in such an area. Though methane gas can be generated from landfills, high levels of nitrogen sulphide, chlorides, carbon dioxide and other toxic and poisonous substances (Cunningham et al,. 2005; Duncan, 1996) have reduced the recycling process in developing countries to a minimal level. It is estimated that one million tonnes of waste in a sanitary landfill site can result in the release of 0.5 million tonnes of carbon dioxide (a greenhouse gas) - three times the emission from an incineration plant (Gray, 1997).

Recycling Waste

Recycling as a process of waste management, involves the recovery and reuse of materials that are discarded (Cunningham et al., 2005; Enger & Smith, 1992; Nadakavukaren, 1990). Physical reprocessing involves the collection and sorting of everyday waste substances which are water insoluble and large (Gupta, 2006). Materials like aluminium, beverage cans, glass bottles, paperboard, cartons and bones (Mckenzie & Pinkger, 1997; Anspaugh & Ezell, 1995) are sorted. Common types of the raw materials from which the items are made, are processed into new products (Cunningham et al., 2005).

Composting is a type of recycling though not always counted as such (Gray, 1997). Biologically, discarded insoluble materials are grounded mechanically to reduce particles. It is subsequently mixed with sewage containing excreta and incubated for six weeks (Gupta, 2006). Wet and dry refuse is heaped in alternative layers on $2.5m^2$ and $1.5m^2$ dept. It is covered with grass or earth and recycled as compost (mulch) for agricultural purpose (Mckenzie & Pinger, 1997). Materials that can be used for compost heap include plant materials, food scraps and paper products. Biological composting and digesting processes are therefore used to decompose organic matter. The heap is turned after 30 days, 60 days and ready after 90 days (Wood et al., 1997). A study on municipal household solid waste in Cape Coast revealed that 57% of total household waste in the municipality is biodegradable (Sappor, 2005). ‘‘This implies that if the practice of composting is adopted, the amount of household waste that goes to landfills and refuse dumps would reduce by this margin’’ (Sappor, 2005 p. 28). The practice of

composting waste when adopted in schools will go a long way in solving waste management problems.

Gas from the process of composting can also be captured and used to generate electricity (Duncan, 1996). A field study in Sierra Leone (Palokko, 32km from Freetown and King Tom sanitary landfill in Freetown) in 1983/1984 cites methane gas content raging between 27% and 52% (Duncan, 1996). Waste recovery process therefore enables energy to be extracted from discarded material and used as a combusting fuel or indirectly as another type of fuel.

Alternatively, basic school students can use waste materials for composting to recover manure to be used for gardening. Though the generation of waste is increasingly posing problem, when waste is recycled it becomes a resource (Johnson, 1990).

Waste Avoidance and Waste Reduction

Waste avoidance is the process of waste minimization aimed at the prevention of the creation of waste materials (Mckenzie & Pinger, 1997; World Bank, 1998). It involves action(s) of producers to avoid the generation of waste (World Bank, 1998) by either redesigning products or changing societal pattern of production and consumption. The process of waste reduction and avoidance includes use of cotton instead of plastic bags for shopping, reuse of second-hand products and repair broken items instead of buying new ones (Mckenzie & Pinger, 1997). Products are expected to be reusable, durable and long-lived rather than throwaway ones.

This method of waste management ensures sustainable use of resources. In 1990, Germany banned the disposal of toxic halogenated

solvents by incineration at sea (Puckett, 1994). The legislation resulted in innovative approaches to waste disposal leading to reduction of waste from 180,000 tonnes in 1989 to 50,000 tonnes in 1992 (Puckett, 1994). In the Philippines, the Ecological Solid Waste Management Act 2000 (Republican Act 9003) laid emphasis on waste minimization, recycling and reuse by prescribing a 25% recycling and reuse of all collected solid waste

(Van Burren & Dieu, 2009). The Republican Act 9003 also provided clear guidelines for sanitary landfills as well as prohibits the opening of new dumpsites.

Hazardous waste can be reduced or eliminated by substituting polluting products with non-polluting ones (Goldsmith & Hildyard, 1988). Goldsmith and Hildyard (1988) cited a mining and manufacturing cooperation in Minnesota (U.S.A.), whose pollution prevention strategies in 1975 resulted in the elimination 10,000 tonnes of water pollutants, 90,000 tonnes of air pollutants and 140,000 tonnes of sludge in 1984. The adoption of the technology also saved the corporation $192 in less than ten years.

The institutionalization of waste avoidance and reduction will go a long way to inculcate maintenance culture among basic school students. Consumers as well as students within the basic school system can contribute to waste reduction by minimising the use of disposable products and non-biodegradable devices.

Waste Management Facilities and Practices in Schools

The level of inadequacy of human waste disposal facilities in both rural and urban schools can be seen if one compares the situation with the prevailing condition in the country. During the period 1994-2004, the CWSA

constructed 32,000 household latrines as compared to a targeted 93,000 latrines per year by the millennium development goal (Larbi, 2006). In addition, the CWSA built 2,200 school sanitation facilities during the period 19994-2005 as compared to 4000 schools built 2001-2005 (Larbi, 2006). The inadequacies in the larger communities as well as the schools are indications of pressure on existing toilet facilities in schools. In urban areas 40% use public toilet, 35% of households use (WCs), 15% households use pan latrine, five percent still use of pit latrine and five percent also use other unapproved options (Larbi, 2006). A survey in 11 communities in Ghana revealed that only a small fraction of the population has access to acceptable standard of sanitation with several households depending on over loaded public toilets, while others practice open defecation in the bush paths. The study also revealed that public toilets operated below the minimum acceptable standards in terms of supply capacity (Government of Ghana, 1993).

Notwithstanding, national bureaucracies behave as though quality education and facilities should not be wasted on children in sparsely populated areas (Sher, 1981). Apart from pit latrine, open defecation is still common in rural areas (Duncan, 1996). This system of free range could be in use even in some urban schools for both urine and faecal waste disposal especially when such a school is situated near the bush.

Recommended toilet facility for basic schools must be kept clean; in good operation and have smooth impervious surface (Duncan, 1996; Redican, Olsen & Baffi, 1993). They must also be conveniently located, accessible to the disabled and have washbasin with soap and towel dispensers. Although from the health point of view urine has no special hazards, urinals must be

kept clean with one urinal per 30 students (Redican et al., 1993). This is to ensure that insanitary conditions do not bring about infections and contaminations. The number of trash receptacle inside and outside school classrooms, offices lavatories and cafeterias/canteens must depend on the level of refuse generation (Radican et al., 1993). Lavatories and canteens are however required to have lidded baskets and emptied daily.

In urban areas, waste collection attracts a fee directly or indirectly through tax. Where a fee is collected for waste disposal people tend to dump refuse indiscriminately (Annoh & Mainoo, 1994). Residents close to school communities tend to dispose waste on school premises because schools are usually exempted from paying fees for dumping.

> ... an integrated collection and separation system for domestic and commercial waste can be developed at little or no extra cost to local government ...To achieve this, systems are required that make the collection of recyclables and compostables an integral part of the process and not a 'bolt on' extra (Gray, 1997 p.79).

Waste Management and the School Curriculum

Environmental Studies remain insignificant in most school curricula in third world countries. The teaching of environmental science from Kindergarten to advance levels is rather rare. It is either being combined with other disciplines such as geography, social studies botany or agriculture or confined only to a few years at school (Arthur, 1981). Waste management practice is not being taught in Ghanaian basic schools as a subject. However, it is taught as an integrated field of study (Tamakloe, 1991). Thus it has assumed the name "environmental studies" (Arthur, 1981) and ''social studies"

(Tamakloe, 1991). The integration approach of the teaching of environmental issues aims at instilling the culture of valuing, investigation and decision-making on what to do in the elementary years of education (Arthur, 1981). This makes students to see knowledge at the early stages of school in holistic manner (Tamakloe, 1991). It also enables students make analysis and describe contemporary problems that provide self-direction (Arthur, 1981; Tamakloe, 1991).

There are varied pedagogies expanded to teach the integrated environmental issues. The concept of the hidden curriculum approach defines the emotions, social and intellectual life without necessarily fostering and confining issues to the classroom. This approach relates to the study of man in relation to his environment: how he uses it, and what he derives from it (Arthur, 1981; Tamakloe, 1991). The spiral curriculum approach adopts the process of teaching issues on the environment within each discipline of Social Science (Arthur, 1981). While the widening horizons curriculum holds that, the study of human beings and their environment must start form the family to the neighbourhood and gradually extend to the larger global state.

The teaching approach of environmental health issues is varied. Anspaugh & Ezel (1995) suggest strategies for teaching environmental health:

> ...strategies used in health education include brainstorming; buzz group; case studies; debates; storey telling; lecture, group and panel discussions; and committee work. All these employ discussion to a larger or lesser degree. More action oriented strategies include dramatization, cross puzzles, demonstrations and experiments, exhibits, models and specimens, field trips and games...serve as

> valuable approaches for involving students in the learning process and for enriching the classroom. Examples of media include computers, television, videotapes, films, transparencies and audio recordings (Anspaugh & Ezel, 1995, p.119-120).

Otiende and associates (1997) intimates that a comprehensive methodology for Environmental Education must include a variety of pedagogical approaches like inquiry method, the system method, relevance method, the process method and value classification method. Such approaches must be interdisciplinary or multi-disciplinary or problem solving or community-based or a combination (Otiende et al., 1997). These approaches and strategies to Environmental Education are meant to foster appreciation of the environment and subsequently ensure effective waste management.

A study by Howe and Disinger, (1988) revealed that outdoor settings were effective in teaching environmental awareness issues. The study also identified case study, field trips, community inventory project and community action project as effective instructional strategies for developing environmental responsibility. The use of small group discussion, dilemma discussions, role playing, role models and monitoring, participating in community clubs and peer teaching (Matthew & Riley, 1995) are also effective methods. These approaches allow students to gather in-depth knowledge, use critical thinking skills and apply what they have learnt (Matthews & Riley, 1995). Interdisciplinary approach and the use of problem-based learning methods allow for reflection (Knapp, 1996) and also offers a chance to explore and shape values, attitudes and behaviour towards environmental issues (Attarian,1996).

School clubs provide an exciting opportunity for children to explore the connection in their environment in a peer-oriented setting (Flynn et al., 2002). The goal of such clubs is to increase student awareness in environmental issues. Activities of environmental/sanitation clubs include establishing or improving a recycling programme on the school grounds, conducting Environmental Education for younger grades, planning local student environmental awareness action conferences, fund-raising for environmental causes and participating in clean ups (EETAP, 2004). Clubs in Elementary Schools help provide co-curriculum environmental activities for children as well as foster a community of environmentally minded citizens in the present and the future. The establishment of school conservation clubs is a technique being used at schools at both primary and tertiary levels (EETAP, 2004). A study aimed at facilitating the establishment of environmental clubs in elementary schools finds that; many people in the school system are aware of the need for a more pro-active environmental activity within the school community. It also revealed that school administration is supportive of environmental initiatives taken by teachers (Flynn et al., 2002). A survey on Environmental Education in Senior Secondary Schools in Sunyani Municipality in Ghana shows that environmental clubs were non-existing and its derivatives were yet to be felt (Addai, 2007). In Accra, environmental clubs were formed in schools through the collaborative efforts the Metropolitan Education Office and the Waste Management Department under AMEHI programme (CDD-Ghana, 2002). The clubs exposed members to sanitation issues like personal hygiene and proper way of waste disposal (CDD-Ghana, 2002).

A study in Poland, which aimed at evaluating school waste programmes, revealed that environmental knowledge does not necessarily lead to improved practice (Grodzinska-Jurczak et al., 2003). There is therefore the need to go beyond the use of simplistic and short-term approaches to environmental behaviour-change and waste management in basic schools. The use of environmental clubs that will incorporate sports and clean-ups in their activities (Munro, 1992) will go a long way to instil in students/pupils in both urban and rural basic schools skills needed to effectively and efficiently reduce and manage waste.

Summary

Attempts have been made to explore the relevant and related literature on the topic under review. Most of the related literatures reviewed do not have issues on waste management practices in urban and rural basic schools. As a result, a substantial number of empirical studies directly related to the research topic were not found. However, few related general studies and empirical findings are cited. The review came out with varied references to explain what constitute the environment, sanitation and waste management. This is to enable the researcher identify environmental waste variables and determine the scope within which the study will be delimitated. The search on the theoretical dimensions of knowledge, attitude and practice and the subsequent citing of empirical studies provides conceptualise basis to the research. Review on the health dimensions of mismanaged waste in both rural and urban areas provide the further basis for reviewing literature on faecal and general waste management method in existence. The role of the school and for that matter the curriculum in the dissemination of information on environmental

health education especially among children through the main content curriculum and co-curricular activities like environmental clubs was also reviewed. The review of related and relevant literature affords the researcher the opportunity to make comparison of types of waste generated as well as refuse and human faecal waste disposal facilities and practices in rural and urban basic schools in the study area.

CHAPTER THREE

METHODOLOGY

This chapter focuses on the methodology used in the study. It covers the research design, research population, sample and sampling procedure, research instrument, pilot study, data collection and data analysis procedures.

Research Design

The researcher adopted a quantitative approach to the study. The quantitative approach to research aims at developing knowledge by collecting numerical data on observable behaviours of samples and subsequently subjects these data to numerical analysis (Gall, Borg & Gall, 1996). This approach is meant to test a significant number of variables and help facilitate the communication of results to policy makers and more positivist researchers.

The descriptive survey design was used for the study. This design aims at making careful description and interpretation of phenomena as they exist. This is done by collecting data from the target population so that the status of the population will be determined with respect to one or two variables (Gay, 1987). The descriptive survey is concerned with ‘‘conditions or relationship that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing’’(Best & Kahn, 1998 p.113). The descriptive design therefore focuses on obtaining answers from a population using carefully designed and administered questionnaire (Fraenkel & Wallen, 2000). It does not only focus on relationship between variables, but also on the

analysis and interpretation of functional relationship. This means that descriptive survey deals with ‘‘relationship between variables, the testing of hypotheses, and the development of generalizations, principles or theories that have universal validity ’’ (Best & Kahn, 1998 p.144).

The decision to use the descriptive survey is because it is versatile, practical and often used in social science and educational research involving large sample size (Osuala, 2001; Wiesma, 1980). Its use is also recommended in studies in which generalization will be made from sample to population so that inferences will be made about some attitudes and behaviours of the population. The approach can therefore be used to gather data with the view of describing waste management practices of urban and rural basic school students in Adaklu-Aynigbe District and Ho Town. In addition, the study is non-experimental and does not involve the manipulation of phenomena to determine causal relationship. Rather, variables in the study will be studied in their natural setting. In addition, the use of the descriptive survey design afford the researcher the test of hypotheses.

The descriptive survey design however has some weaknesses that were addressed to guard against the effects of such weaknesses on the validity of findings. The weakness of false and careless responses to some questionnaire, because respondents feel they deal with values and attitudes. This problem was addressed by explaining the purpose of the study to respondents. The questionnaire was also exposed to vetting, pre-testing and readability test to guard against unclear and ambiguous wording.

Population

The study covered a target population comprising all students in public and private basic schools within the Adaklu-Anyigbe District and Ho township in Ho Municipality. Data from the District and Municipal Education Directorates for 2009/2010 academic year put the target population at 30,524 students from 181 public and private basic schools in the study area. The accessible population of 8,242 was made up of fifth and sixth year pupils in the Primary Schools and second (basic eight) and third year (basic nine) students in the JHS in the study area.

Basic schools located in communities with population more than 5, 000 are designated in the study as urban basic schools. Inhabitants in such settlements usually have better provision of social amenities and are employed in the industrial and services sector. Rural basic schools on the other hand are located in communities with undeveloped infrastructure, usually engaged in natural occupations like farming and have population less than 5,000 inhabitants.

Sample and Sampling Procedure

The total sample size of the study was 190 respondent students/pupils out of an accessible population of 8,242. Though theoretical sample size for different sizes of population at 95% level of certainty put the sample size for population between 5,000 and 50,000 at 351-381 (Anderson, 1996), researchers who adhere to the quantitative tradition are more concerned with sampling which is representative of the population.

In order to guard against too small size in sub-group, subsequent effect on statistical significance (Gall et al., 1996); each sampled primary, JHS and

private school from the urban and rural settings had a minimum of 30 sampled students.

The probability sampling method was adopted. This is to satisfy the demand of positivist style of research that has been chosen. The probability sampling ensures that each unit of the study population was chosen based on chance and therefore has an equal chance or at least a known equal chance of being included in the sample (Gall et al., 1996). A multistage approach of the probability sampling was used. This approach is a combination of sampling methods that is usually used in community-based studies. In such studies, respondents are from different villages/towns and have to be chosen from different areas, as is the study in question.

Firstly, the strata from which samples were drawn were identified. These were the three traditional areas namely Ziope, Agortime and Adaklu in the Adaklu-Anyigbe District on one hand and the Ho Town in the Ho Municipal Assembly on the other. Sampling of public and private basic schools in the Ho Municipality was purposively done to represent urban basic school students/pupils responses on waste management while sampling from the Adaklu-Anyigbe District was done purposively to represent rural basic school students/pupils. Two circuits, out of the five in the urban township of Ho were sampled. One circuit each was sampled from Adaklu, Ziope and Agortime traditional areas. Thus, a combination of simple random sampling and purposive sampling was adopted in the sampling of education circuits and schools. This was done to ensure that data collected on students waste management practices covered different categories of students /pupils in basic schools in the study area.

A system of balloting was adopted to sample circuits and schools. Circuits in each stratum were given codes that were written on pieces of paper. Each piece was folded, mixed together and picked one at a time. The following three rural based circuits were sampled from the Adaklu-Anyigbe district: Adaklu-Waya circuit was sampled from the Adaklu Traditional area, Ziope circuit was sampled from the Ziope Traditional area and Afegame circuit was sampled from the Agortime Traditional area. Two urban-based circuits sampled from the township of Ho were Bankoe and Housing circuits. In all, 10 urban-based basic schools, including 3 private schools and 10 rural-based basic schools including two private schools were sampled (Table 1).

The simple random sampling variant of the probability sampling was used to select respondent pupils/students. It involves the selection of sample from a population by using a process that provides every sample of a given size an equal probability of being selected (Gall et al., 1996). This sampling procedure has the following advantages over other probability and non-probability methods of sampling because it is highly representative of the total study population as compared with convenient sampling. It also affords the researcher the means to collect data that facilitate generalization to the larger population within small margins of error (Scott & Usher, 1996). Further, the simple random sampling satisfied the logic by which the null hypothesis was tested using inferential statistics (Gall et al., 1996). Lastly, the procedure reduces bias in sampling usually associated with other methods. That is, any difference that occurs in the use of simple random sampling could be because of chance rather than bias on the part of the researcher.

Table 1

Sample Frame of Students used in the Study -2009/2010

Name of School	Location Urban/Rural	Student Population	Sample Size
1. Ho Anglican Primary	Urban	251	9
2. Bankoe Methodist Primary ('B')	Urban	256	9
3.Bankoe E.P. Primary ('A')	Urban	480	10
4. Ho Fiave E. P. Primary	Urban	85	8
5. Ho Bankoe E.P. JHS ('B')	Urban	285	10
6. Ho Police Depot JHS	Urban	204	14
7. Ho Fiave SDA JHS	Urban	178	8
8. Alpha Inter JHS	Urban (private)	112	15
9. Prince Charles Jub. Sch. (Prim)	Urban (private)	71	6
10. Springs JHS	Urban (private)	201	9
11. Adaklu-Kpodzi E .P. Primary	Rural	159	7
12. Ziope R. C. Primary	Rural	450	10
13. Takuve L.A. Basic (Primary)	Rural	147	6
14. Akuetteh L. A. Primary	Rural	102	7
15. Akuetteh L.A.JHS	Rural	71	7
16. Adaklu-Anfoe E. P. Basic (JHS)	Rural	87	6
17. Adaklu-Torda JHS	Rural	326	10
18. Ziope JHS	Rural	263	9
19. Brilliant Academy (Primary)	Rural (private)	95	9
20.King Solomon International JHS	Rural (private)	308	21
Total		4,231	190

A table of random numbers was adopted as the main sampling frame to sample students. A list of students from sampled schools was obtained from the class attendance registers of the individual sampled schools and codes assigned to these names sequentially. To start the sampling process, the researcher randomly starts from any number on the table of random numbers, for example, closes his eyes and places a finger on a number on the frame and moves up or down selecting students that correspond with numbers on the frame of random numbers.

Background Characteristics of Respondents

The researcher deems it necessary to enquire of this information to enable him know the types of respondents he was dealing with and also establish whether respondents personal information had any effect on waste management practices in urban and rural basic school students.

Table 2 presents responses given by respondents on their sex.

Table 2

Sex Distribution of Student Respondents

	Urban		Rural		Total	
Sex	Frequency	%	Frequency	%	Freq	%
Male	48	49	44	48	92	48
Female	50	51	48	52	98	52
Total	98	100	92	100	190	100

The data from Table 2 shows that 48% (92) of respondents were male while 52% (98) were female. Urban-based male respondents were 49% (48) and their females were 51% (50). On the other hand, rural-based female

respondents constituted 52% (48) and their male counterparts were 48% (44) of students sampled. The study therefore gives a fair distribution of sex and can be said to be gender sensitive.

Table 3 represents responses given by respondents on their age.

Table 3

Age Distribution of Student Respondents

	Urban		Rural		Total	
Age Group	Freq.	%	Freq.	%	Freq	%
9-12	14	14	23	25	37	19
13-16	82	84	55	60	137	72
17-20	2	2	14	15	16	9
Total	98	100	92	100	190	100

Table 3 reveals that 72% (137) respondents made up of 84% (82) urban and 60% (55) rural were between the ages of 13 and 16. On the other hand, 14% (14) urban respondents and 25% (23) rural respondents were between the ages of 9 and 12. Only 2% (2) of urban respondents as compared with 14% (15) rural respondents fall within the age group of 17 and 20.

Table 4 shows that student respondents were sampled from four different classes. Total urban respondents in classes five and six (Primary) was 21% (21) each while that for rural classes five and six was 21% (19) and 22% (20) respectively.

Table 4 represent academic level of student respondents.

Table 4

Academic level of Student Respondents

	Urban		Rural		Total	
Class/basic	Frequency	%	Frequency	%	Frequency	%
5	21	21	19	21	40	21
6	21	21	20	22	41	22
8	28	29	26	28	54	28
9	28	29	27	29	55	29
Total	98	100	92	100	190	100

The general conclusion that can be drawn from the analysis of the biographical data (items 1-3) which examines the personal information of respondents was that, some respondents may not have the competence (in terms of age and academic level) to respond to the questionnaire on waste management practices by students in their schools. Some level of assistance from the researcher or his assistants could be needed. A higher number of female respondents also reflect the situation where there are usually more females than males in basic schools. Although more respondents were sampled from JHSs than primary schools because the former category of respondents were more mature and can respond more accurately to the questionnaire. The age and academic level of both urban and rural respondents was similar. The age distribution of respondents is similar to one used in a study among young primary school pupils (Grodzinska-Jurczak et al., 2003). The age distribution also reveals that respondents fall within the concrete and formal operation and therefore capable of making scientific reasoning and were not likely to base their responses on waste management on mere guess.

These independent variables of age, sex and academic level are likely to influence the generation and disposal waste.

Research Instruments

A questionnaire was adopted as the main data collection instrument. The questionnaire was predominantly the close-ended type with multiple-choice options. This was to afford all respondents to answer the same set of questions using the same set of alternatives. It also afforded an easier way of processing the data as compared with the open-ended questionnaire and interview schedule, which place no restriction on respondents although they provide insights that the researcher might not have taught about.

Two sets of questionnaire were administered. The main questionnaire was administered to sampled students (Appendix A). It consists of three sections with a general instruction directing respondents to either tick where appropriate or provide their own information where necessary.

Section A consists of three items. It contains biographic data of respondents. A number of alternatives were provided from which respondents were to select the appropriate one. The inclusion of this section was seen to be of importance because independent variables like sex, age and whether a respondent is in a Primary or a JHS could cause variation in waste management in basic schools.

Section B covered issues on refuse generation and disposal in basic schools. Respondents were required to respond to a12-item question/statement by ticking an option from alternatives provided. They were required to respond ‘‘YES’’ or ‘‘NO’’ to show whether plastic materials like polythene, paper and paper products, food leftovers, industrial materials like discarded

TV sets and aluminium, agricultural waste like animal droppings as well as human faeces were the types of waste managed by students/pupils. The adequacy or otherwise of collection facilities, where refuse is disposed, whether waste generated was burnt or not, the frequency of burning and the existence and patronage or otherwise of environmental/sanitation clubs were also explored under this section. The questionnaire used by Sey-Haizel (1999) served as a guide for the construction of items under this section. General issues on waste management in Ghana were modified by relating them to the school environment while aspects of the questionnaire on funding waste management were eliminated.

Section C covered issues on human faecal waste generation and disposal. It consisted of a 7-item question/statement. It dealt with whether respondents had toilet facilities in their schools, the type(s) of toilet facilities in use for disposing human faecal waste, adequacy or otherwise of toilet facilities in use, why respondents use other toilet facilities while in school and the type of facilities used by pupils/students who do not have toilet facilities for their schools.

School authorities of sampled schools responded to a second set of questionnaire (Appendix B). This set of supplementary questionnaire was meant to provide additional information on pupils'/students' waste management practices which, if left to students might lead to high-level guess responses. A 12-item questionnaire provided information on waste management method used by students, the level of re-use of waste materials by students, type of toilet, number of individual toilet seats and the existence or otherwise of environmental clubs in sampled schools.

Readability of Instrument

The readability of the research instrument was assessed by randomly sampling pupils/students from upper primary and JHS to read and comment on their understanding of the items. In addition, pre-testing of the questionnaire was also used to determine readability.

Pilot Study

The questionnaire was pre-tested on pupils/students from five basic schools who do not constitute respondents for the main study.

The schools were made up of three rural-based schools in Akatsi District and two urban-based schools in Dzodze in Ketu North District. The selected schools as well as the students sampled had comparable characteristics as those in the target population for the study. Twenty students made up of four students from each sampled school were used for the pilot study. This conforms to Gay (1987) who intimates that such a study should not be less than 20 respondents.

The purpose of the pilot study was to enable the researcher reform some items in the questionnaire and make final selection. It also helped detect some ambiguities that were inherent in the items as well as determine the appropriate time that could be used in completing the final questionnaire. It was also used to assess the readability as well as add credence to the validity and reliability of the final questionnaire.

Permission was obtained from the Head teachers. Dates were also fixed with them for the pilot study. Sampled students were assembled in one classroom and the purpose of the exercise was explained to them. They were made to respond to the questionnaire within as much time as possible though

the time for starting and finishing was recorded. The researcher discussed with respondents problems encountered with the questionnaire for redress. Data collected was partially analysed.

Reliability and Validity of Instrument

The reliability of a research instrument is the proportion of the variance in the observed scores that are free from error. The reliability index ranges from one, when there is 'no error' in measurement, and zero when the measurement is full of errors. The reliability of the instrument was calculated through the use of Statistical Package for Social Sciences (SPSS) under Cronbach's Alpha Coefficient. The main instrument administered to student respondents had a reliability of 0.63. This conforms to Tuckman (1975) who holds that a teacher-built test of reliability of 0.60 is usually considered adequate. However, the supplementary questionnaire responded to by the school authorities of sampled students had a reliability of 0.51.

Apart from pre-testing the questionnaire, validation of the instrument was carried out through discussion of urban and rural waste management issues with stakeholders. Teachers and students/pupils in the basic school sector were quizzed about prevailing behavioural practices involved in waste management. This was to cater for face validity. The aim was to ensure that items measure behavioural practices of basic school students towards waste management.

To ensure that the entire content area of the study was covered, information about environmental waste and sanitation was sought from District and Municipal Directors of waste management in the study area. One of these officials was given the draft instrument for content validation. In

addition, two lecturers from the Department of Health, Physical Education and Recreation (HPER), University of Cape Coast (UCC), worked independently on the questionnaire and made comments for modification.

Data Collection

To depict the academic nature and authenticity of the study, the name of the UCC and the Department of HPER was used for the heading of the questionnaire. In addition, an introductory letter was obtained from the Department of HPER, UCC, (Appendix C). Human participation approval was also sought from Adaklu-Anyigbe District Education Office at Kpetoe (Appendix D) and Ho Municipal Directorate of Education at Ho (Appendix E). The set of questionnaire administered to students and school authorities were attached to the permission letters. This was to enable the District and Municipal directorates of education to be aware of the content.

Prior to the administration of the questionnaire seven individuals were recruited and trained as research assistants to assist in the administration of the questionnaire. They were made up of university and polytechnic graduates teaching in Senior High Schools (3), certificated teachers in Basic Schools (2) and Senior High School leavers (2). The training session included going through the questionnaire item by item, interpreting them verbally into the local Ghanaian language (Ewe), discussing ethical issues to be considered on the field: confidentiality and respect to human subjects as well as cross checking of responses.

Sampled schools were visited with the research assistant(s) with letters of introduction form HPER and district and municipal directorates of education. On arrival in each school, the researcher/his assistant(s) introduced

themselves to the Head teacher and handover letters of introduction to him/her. This was followed by a brief explanation of the purpose of the visit and subsequent discussion on urban-rural waste management by pupils/students in basic schools. This was meant to establish good rapport with the school officials and erase any possible wrong notion that could be extended to the respondents. The researcher and his assistant(s) use the initial visits to sample students and fix dates and time suitable and less likely to affect the normal academic schedule of the schools.

Administration of Questionnaire

The questionnaires were administered to sampled students and school authorities during the first term of the 2009/2010 academic year in the months of November and December. Since the period was the beginning of a new academic year, the researcher ensured that respondents to the students' questionnaire were not students on fresh admission. This is to help reduce the incidence of guess responses.

Despite an introductory heading explaining the purpose of the study, verbal explanation was given to respondents. They were also assured of confidentiality and anonymity. This was to make them relax and remove the notion of examination from their minds. The need to give candid responses and work independently was however emphasised.

Sampled students were assembled into one classroom and the purpose of the study and how to fill the questionnaire explained to them. Respondents were allowed as much time as needed to complete the questionnaire. In cases, especially in the primary schools, where some respondents had difficulty in reading, the questionnaire was read item by item for them to respond to. The

researcher or his assistant(s) also interpreted the items into the local Ghanaian language (Ewe) to some students. The researcher or his assistant edited completed questionnaire for possible omissions in responses. This approach to the administration of the questionnaire resulted in 100% completion and return rate.

Data Analysis

Information gathered was first checked for clarity and accuracy. Responses to questionnaires for students and school authorities were organised and analysed in line with the research questions for which the instruments were designed. The main unit of analysis in the study was the individual students and not the schools. The analysis of data was done by SPSS programme to produce descriptive statistics in the form of frequency counts and percentages for the analysis of major variables of the study. The emerging findings were described. Majority of responses on each item were accepted as representing the general views expressed by the respondents on the particular item.

The results of the findings were interpreted and waste management practices by students in urban and rural basic schools compared. The Chi-square (X^2) was used to test the hypothesis of the study to facilitate the comparison of waste management practices of urban and rural basic school students. The fact that categorical data in the form of types of waste generated, refuse and human faecal disposal facilities by students were collected from urban and rural basic students, informs the choice of the Chi-square.

The research questions were taken one at a time and the collected data on them analysed in order to arrive at findings to help answer the questions. In

most cases, to find out if urban/rural residence was associated with waste disposal and management, data collected were used to test hypotheses, and outcomes used to answer or confirm answers to research questions.

Findings from items 4, 5, 6, 7, 8 and 9 of student questionnaire were used to find answers to the Research Question 1. Descriptive statistics was used to present the types of waste generated in urban and rural basic schools in the study area. In cases where percentages do not provide clear evidence in terms of differences in the types of solid waste generated, sub-hypothesis of specific waste types were tested to provide empirical basis for comparing types of solid waste in urban and rural basic schools. In order to test the Hypothesis 1, Section B of students' questionnaire items 6, 7, 8 and 9 was used to ascertain whether any significant difference exited between rural and urban basic school students in terms of the types of waste generated.

Answers to Research Question 2 were sought through findings from items 10, 11, 12 and 13 of students' questionnaire. Tables and percentages were used to present and compare urban and rural basic school students' refuse management practices in the study area. Hypothesis 2 was not tested because results from the research question showed that the management of refuse by both urban and rural basic school students does not reveal any difference.

Items 1, 2, 3, 4 and 5 of school authority's questionnaire were used to find answers to Research Question 3. A table on refuse disposal methods was used to facilitate comparison of urban and rural students' waste re-use.

Hypothesis 3 was not tested because results from the research question showed that both urban and rural basic school students do not undertake any effective waste re-use programme.

Answers to Research Question 4 were sought by using responses from items 16, 17, 18, 19, 20, 21 and 22 of student questionnaire. Tables were used to depict differences or otherwise in urban-rural waste management practices and facilities in the study area. In order to provide further answers to the research question, a cross tabulation was ran for items 16, 17, 18, 20 and 20 and a chi-square used to test the hypothesis.

Responses from items 14 and 15 of student questionnaire as well as 8 and 9 of the questionnaire for school authorities were used to provide answers to Research Question 5. These findings on students' patronage or otherwise of environmental club(s) were compared with findings on student refuse management (Research Question 2). Hypothesis 5 was not tested because results from research question five revealed that environmental club(s) does not exist in both urban and rural basic schools in the study area. Hence, students do not belong to any environmental club(s).

Responses from items 6, 7, 10, 11 and 12 of questionnaire for school authorities were used to find answers to the Research Question 6. These findings were further used to determine student-toilet-ratio in each sample school and subsequently compare urban and rural student-toilet-ratio in the study area.

CHAPTER FOUR

RESULTS AND DISCUSSION

This chapter deals with analysis of data gathered from 190 student respondents and 20 school authorities sampled from urban and rural basic schools. The results of the study are presented by first dealing with how the research questions of the study were answered and secondly how the hypotheses of the study were tested. This was followed by the discussion of the results of the main data of the study. The focus of the study was to compare waste management practices of urban and rural basic school students. The analysis and discussion centres on comparing types of refuse generated, waste disposal practices, waste re-use, facilities for human faecal disposal, students' membership of environmental/sanitation clubs and student-toilet ratio. The interpretation of the data was facilitated by the use of tables and percentages.

This section deals with the analysis and discussion of students and school authorities' responses on waste management practices by students in urban and rural basic schools. The section is discussed in line with the research questions of the study.

Types of Solid Waste generated in Urban and Rural Basic Schools

Table 5 shows that all urban and rural respondents 100% (N= 190) indicated that plastics in the form of polythene and ice water bags as well as

paper and paper products exist in the main waste stream in their schools. All 92 rural respondents as compared to 62% (n=61) of urban respondents also indicated that agricultural wastes in the form of animal droppings abound in their school premises. In terms of food leftovers, 4% (n=4) of urban respondents as compared to 10% (n=9) of rural respondent indicated that it forms part of the waste stream in their schools. While 32% (n=31) of urban respondents indicated that human faeces were present on their school premises, 36% (n=33) of rural counterparts also indicated that human faeces exist on their school premises. Only 10% (n=10) of urban respondents as compared to 5% (n=5) of rural student respondents indicated that industrial scraps in the form discarded aluminium, TVs and computers constitute waste on their school compound.

Table 5

Different types of Solid Waste in Urban and Rural Basic Schools

	Urban	Rural	Total	
Types	% Yes	% Yes	%Yes	X^2_{df}
Plastics	100 (n=98)	100 (n=92)	100 (n=190)	-
Papers	100 (n= 98)	100 (n=92)	100 (n=190)	-
Food leftovers	4 (n=4)	9 (n=10)	13 (n=14)	2.42_1
Scraps	10 (n=10)	5 (n=5)	15 (n=8)	1.48_1
Animal faeces	61 (n=62)	92 (n=100)	153 (n=81)	43.14_1
Human faeces	31 (n=32)	33 (n=36)	64 (n=34)	$.38_1$

A chi-square test to find out if the disposal of food leftovers on basic school premises was associated with residence revealed that X^2 (1, N=190) =2.42, p < .05 was statistically significant. X^2 test on the presence of human faecal waste on basic school premises further revealed that X^2 (1, N= 190) = .38, p < .05. This difference was statistically significant. Also, Chi square test on the presence of industrial scraps in the form of discarded aluminium TVs and computers revealed that X^2 (1, N=190)=1.48, p < .05 was statistically significant. Thus, there is no significant difference between the presence of food leftovers, human faeces as well as industrial scraps in the form of discarded aluminium, TVs and computers and urban/rural residence of basic school students in the study area. On the other hand, chi-square test on the presence of agricultural waste in the form of animal droppings on basic school premises revealed that X^2 (1, N= 190) = 43.14, p > 0.05. This means that the difference between having agricultural waste materials in the form of animal droppings in rural/urban basic schools was statistically not significant.

Whereas Chi square test on food leftovers, human faeces as well as industrial scraps in the form of discarded aluminium, TVs and computers among urban/rural basic school students in the study area supported the prediction made in the research hypothesis that solid waste generation in urban and rural basic schools differ, test on the generation of agricultural waste in the form of animal droppings does not support the prediction of the research hypothesis.

Many authors support the finding that plastic waste material is common in both urban and rural areas. Donnellan (2000) attributes this to its durability, lightweight and resistance to moisture and decay. It however

constitutes a visually offensive litter problem (Essumang, 2000) and a non-biodegradable product that releases toxic fumes and dioxins when burnt (Agbola, 1993).

The finding that human faecal waste is common waste type in both urban and rural basic schools is supported by a study by Nkrumah (2003) which indicated that open defecation takes place on school compounds and uncompleted structures. The presence of biodegradable waste products like paper and paper products, agricultural wastes human faeces and food leftovers in the waste stream in the study area is likely to create conducive condition for pathogenic organisms to thrive. Earlier studies is indicative that unhygienic conditions breed diseases like typhoid cholera and helminthic (worm) infections. Alternatively, Sappor (2005) in a study finds that, the presence of biodegradable matter in waste is an opportunity to compost waste to solve the waste problem as well as improve soil fertility.

Hypotheses on the different types of solid waste in urban and rural basic schools revealed that there is no significant difference between urban and rural basic schools in terms of industrial waste, food leftovers and human faeces. Thus, the research hypothesis was accepted that in term of the generation of these solid wastes urban and rural basic schools do differ. However, hypothesis test on the presence of agricultural wastes in the form of animal droppings revealed that urban and rural basic schools do not differ. Thus, the research hypothesis was rejected in favour of the alternative hypothesis that in terms of the generation solid agricultural wastes in the form of animal droppings, urban and rural basic schools do not differ. It also follows that since all urban and rural student respondents indicated plastics,

paper and paper products in their schools: stakeholder could adopt similar measures to manage solid waste in urban and rural basic schools. These findings on different types of solid waste generation in urban and rural basic school in the study area confirm Ampomaa (1997) that waste management is complex and cannot be tackled from one angle.

Refuse Management Practices by Students in Urban and Rural Basic Schools

In terms of facilities for the collection and disposal of refuse in schools both urban respondents 96% (n=94) and rural respondents 92% (n=85) indicated that they were inadequate. Table 6 presents types of waste disposal facilities used by respondent students.

Table 6

Waste Disposal Facilities for Urban and Rural Basic Schools Students

	Urban		Rural		Total	
Type of disposal facilities	Freq.	%	Freq.	%	Freq.	%
Gutter/anywhere	0	0	0	0	0	0
Dumpsite within school	38	39	77	84	115	61
Carriage by non-students	10	10	0	0	10	5
Dumpsite outside school	50	51	15	16	65	34
Total	98	100	92	100	190	100

Table 6 reveals that 51% (n=50) urban respondents as against 16% (n=15) rural respondents dispose refuse at dumpsites outside their schools. On the other hand, 38% (n=39) urban respondents as against 84% (n=77) use dug holes within school as dumpsite. Only 10% (n=10) urban respondents dispose

waste to be carried by non-students while rural-based students do not enjoy the facility.

Table 7 presents the regularity of burning solid waste within urban and rural basic school premises by students. It shows that 90% (n=88) urban respondents as compared to 92% (n=85) rural respondents indicated that waste generated in their schools is either burnt always or sometimes by students within the school premises.

Table 7

How often waste is burnt by Students

	Urban		Rural		Total	
Regularity of waste burning	Freq.	%	Freq.	%	Freq.	%
Always	35	36	48	52	83	44
Sometimes	53	54	37	40	90	47
Never	10	10	7	8	17	9
Total	98	100	92	100	190	100

The finding that 96% (n=94) urban respondents and 92% (n=85) rural respondents indicated that refuse collection facilities were inadequate confirms an earlier survey by the Ghana Statistical Service that 82.6% households use either public dumpsite or any convenient place like gutters or undeveloped plots of land (GSS, 2002) due to inadequate refuse collection facilities. Nevertheless, indiscriminate waste disposal and dumping of wastes in drains was not a practice by urban and rural basic school students in the study area as was the case in urban and rural communities in Ghana revealed in a study by Kendie (1990) and Songsore (1999). The non-existence of indiscriminate

disposal of refuse in the study area could be due to the absence of drains or gutters in and around sampled schools or the enforcement of discipline.

The use of dug holes/dumpsites within school premises could result in the pollution of ground water by waste leachate. This is because basic schools are not likely to follow recommended procedures for the establishment sanitary landfills. Authors (Gray, 1997; Mckenzie & Pinger, 1997) intimate that the varieties of organic and inorganic rubbish as well as the concentration organic compounds and pathogens determine the level of toxicity of leachate. Although methane gas could be generated from heap of waste, the recycling process has been reduced to a minimal because of the high-level carbon dioxide and other toxic and poisonous substances during aerobic decomposition (Reads et al., 2001; Gray, 1997). Thus, uncontrolled dumping of all form of waste within school premises could lead to a gradual release of carbon dioxide and other greenhouse gases that could be harmful to students and the school community. The finding from the study that there is high incidence of burning of refuse generated in both urban and rural basic schools has implications for air pollution and public health. What is more, some students in both urban and rural basic schools are likely to be exposed to risks by walking long distances or crossing roads in order to dispose refuse at local dumpsites.

Waste re-use by Urban and Rural Basic School Students

Table 8 shows that students in 50% (n=5) urban as well as 50% (n=5) rural schools sampled use local refuse dumpsite as a method for refuse disposal. One urban-based basic school authority that ticked an ‘other’ option indicated that refuse generated in the school was packaged for Zoom Lion, a

private waste management company, to carry. Neither urban nor rural school authority indicated that students use composting or recycling as a form of waste re-use.

Table 8

Refuse Disposal Methods by Students

	Urban		Rural		Total	
Refuse Disposal Method	Freq.	%	Freq.	%	Freq.	%
Incineration/burning in pit	4	40	5	50	9	45
Composting	0	0	0	0	0	0
Local landfill/waste dumpsite	5	50	5	50	10	50
Throwing rubbish anywhere	0	0	0	0	0	0
Recycling	0	0	0	0	0	0
Other	1	10	0	0	1	5
Total	10	100	10	100	20	100

School authorities' responses in relation to the use of old refuse heaps by students on school farm or garden as manure revealed that 90% (n=9) urban and all rural basic schools in the study area do not adopt the practice. One urban school that indicated that old refuse heaps were used further named decomposed materials from refuse dumps as a form of waste re-used practiced by students. Concerning the re-use of plastic and aluminium products, both urban and rural basic school authorities indicated that the practice does not exist among students.

The finding shows that though 5% (n=1) school authority out of the 20 sampled urban and rural basic schools indicated that students re-use waste, none of the schools indicated that students use composting as a deliberate

method of refuse disposal. Composting of refuse by students within or close to school premises could reduce the risk students are likely to be exposed to by carrying refuse to local landfills/dumpsites.

Authors agree that the presence of biodegradable waste products like paper products, plant materials, animal droppings and food scraps in the waste stream creates a conducive opportunity for the composting of waste. Cuningham and associates (2005) and Oluwande (1996) intimated that the use of manure generated from compost help to retain soil water, control soil erosion and improves crop yield. What is more, Rybczynski and associates (1978) revealed that composting destroys 85% intestinal worm ova that are likely to be present in human faecal waste and animal droppings to which students are exposed.

The adoption of composting as a method of waste re-use is a potential means by which basic school students could manage and reduce biodegradable waste generated and at the same time prepare mulch for agricultural purposes. The absence of the practice in urban and rural basic schools in the study area is an indication that refuse generated that could be used, as a resource has become a nuisance to the school community.

Human faecal Waste Disposal by Urban and Rural Basic School Students

In terms of human faecal waste management, 71% (n=70) urban respondents as compared with 86% (n=79) rural respondents indicated that toilet facilities exist in their schools for student use. Table 9 shows that while 27% (n=26) urban respondents who have toilet facilities in their school for student use came from primary schools, 33% (n=30) came from rural primary

schools (representing all sampled schools) have toilet facilities. Only 14% (n=14) urban JHSs students have access to toilet facilities in school.

Table 9

Distribution of toilet facilities by types of school

	Urban				Rural				Total			
Sub-groups	Yes	%	No	%	Yes	%	No	%	Yes	%	No	%
Primary	26	27	10	10	30	33	0	0	56	29	10	5
JHS	14	14	18	18	19	20	13	14	33	17	31	17
Private	30	31	0	0	30	33	0	0	60	32	0	0
Total	70	-	28	-	79	-	13	-	149	-	41	-

Responses from school authorities indicated that out of the 10 urban schools sampled, 30% (n=3) primary schools and only 10% (n=1) JHS (out of three sampled) have toilet facilities for student use. In the case of rural basic schools, out of 10 sampled schools, 40% (n=4) (all four primary schools sampled) have toilet facilities for student use. Twenty percent (n=5) of schools in the study area do not have any form of toilet facility for students. Though all private schools sampled have toilet facilities, rural private schools use pit latrines while public schools in both urban and rural communities have KVIPs for student use.

In terms of patronage of toilet facility, out of 98 urban student respondents sampled, 39% (n=38) use KVIP, 33% (n=32) use WCs while 29% (n=28) have no access to toilet facility in their respective schools and therefore responded to that item of the questionnaire by indicating ‘not applicable’ (NA). On the other hand, 53% (n=49) rural student respondents use KVIP, 33% (n=30), being private schools, use pit latrine.

Table 10 shows the extent to which student respondents have to wait in an attempt to use toilet facilities in their respective schools. Table 10 reveals that 57% (n=56) of urban student respondents as against 63% (n=58) rural respondents indicated that they sometimes wait. Only 4% (n=4) urban respondents as compared with 7% (n=6) rural respondents have never waited in an attempt to use toilet facilities in their school.

Table 10

Waiting before using school toilet facility

	Urban		Rural		Total	
Time of waiting	Freq.	%	Freq.	%	Freq .	%
Always	10	10	15	16	25	13
Sometimes	56	57	58	63	114	60
Never	4	4	6	7	10	5
Total	70	71	79	86	149	78

When student respondents were to indicate whether they use other toilet facilities apart from the ones in their schools, 58% (n=53) rural as against 55% (n=54) urban respondents responded in the negative. With regard to the type of toilet facilities used as an alternative to the ones in their schools, 13% (n=13) and 3% (n=3) urban-based respondents use their house/a house near-by and public toilet respectively. In the case of rural respondents, 14% (n=15) use the bush/uncompleted building while 7% (n=6) use public toilet.

Table 11 presents reasons why student respondents do not use toilet facilities in their schools. The table shows that 15% (n=15) urban-based respondent and 26% (n=26) rural-based respondents indicated that they use

other toilet facilities other than the ones in their respective schools. While 5% (n=5) urban respondents indicated that, their houses were close to the school, 16% (n=16) rural respondents indicated that they did so because the toilet facilities in their schools were not enough. One respondent each from an urban and a rural school who chose the 'other' option indicated that they use other toilet facilities because they were shy to collect the key for the toilet and that the school office where the toilet keys were kept was not opened at the time respectively.

Table 11

Why some Students fail to use Toilet Facility in their School

	Urban		Rural		Total	
Reasons for non use of school toilet	Freq	%	Freq	%	Freq	%
The toilet in the school was smelly	2	2	2	2	4	2
The toilet in the school was dirty	2	2	1	1	3	2
Toilet in the school was not enough	2	2	16	16	17	9
My house is close to the school	5	5	3	3	9	5
I do not like the one in the school	3	3	3	3	6	3
Other	1	1	1	1	2	1
Total	15	15	26	26	41	22

. Table 12 presents facilities used by student respondents who do not have toilet facilities in their schools. Table 12 reveals that 28% (n=28) urban student respondents as compared with 14% (n=13) rural counterparts do not have toilet facilities for students' use in their schools. As a result, while 8% (n=8) urban-based students sampled use public toilet, no rural-based student counterpart use this facility as an alternative. On the other hand, while 6%

(n=6) urban student respondents indicated that they use the bush/uncompleted buildings, only 4% (n=4) use this facility as an alternative to non-existence of a toilet in their schools. Five percent (n=5) urban respondents who chose an 'other' option all indicated that they pay and use a private commercialised toilet across the main road, while 7% (n=6) rural respondents who chose the 'other' option use toilet facilities in a primary school across the main road

Table 12

Facilities used by Students without Toilet in School

	Urban		Rural		Total	
Type of Facility	Freq.	%	Freq.	%	Freq.	%
Public toilet	8	8	0	0	8	5
Bush/uncompleted building	6	6	4	4	10	5
My house /a house near-by	7	7	3	3	10	5
I never used any toilet	2	2	0	0	2	1
Other	5	5	6	7	11	6
Total	28	28	13	14	41	22

Chi-square test on faecal waste management in urban and rural basic schools revealed that X^2 (11, N= 190) = 39.72, $p > 0.05$. This means that faecal waste management by urban and rural basic school students in the study area is statistically not significant. The test therefore does not support the research hypothesis that there is a significant difference between urban and rural basic schools in term of human faecal waste disposal practices.

Findings in relation to human faecal waste management revealed that 86% (n=79) student respondents from rural basic schools that indicated that they have toilet facilities for students' use were more than 71% (n=70) urban-

based basic schools students. Although the study does not aim at finding out which institutions or individuals provided toilet facilities in basic schools, findings that 86% (n=79) rural-based respondents as against 71% (n=70) urban-based indicated that they have toilet facilities in their schools for students. This finding failed to confirm Sher (1981) that national bureaucracies behave as though quality facilities should not be wasted on children in sparsely populated areas. Nevertheless, it was revealed that the use of WCs by students was limited to private urban schools while the pit latrine was also limited to private rural basic schools sampled. However, all sampled urban and rural public basic school that have access to toilet facilities for students make use of the KVIP for the purpose.

The finding that 29% (n=28) urban basic school student respondents do not have access to toilet facilities as compared to a study in Accra that revealed that 4% have no access to toilet (Songsore, 1999). In addition, the finding that 14% (n=13) rural basic school respondents have no access to toilet facilities, as compared with a survey at a suburb in Cape Town that 10% of residents do not have access to toilet (De Swardt, et al, 2005). These are indications that students in urban and rural basic schools were being neglected to the advantage of the larger communities. The absence of toilet facilities for students in 25% (n=5) sampled schools reflects an assertion that in Ghana, the coverage of human faecal waste facilities is low Larbi (2005). The findings that 67% (n=56) urban student respondents as against 79% (n=73 either always waited or sometimes waited before using toilet facilities in their schools confirmed Larbi (2005) that coverage of human faecal waste facilities

in Ghana is low. This finding reveals challenges students face in an attempt to access toilet facilities in their schools.

Dependency of students on school toilet facilities is revealed in responses that indicated that out of the 70 urban student respondents who indicated that they have toilet facility for students' use, 77% (n=54) depend solely on the school toilet while in school. On the other hand, 67% (n=53) out of the 79 rural respondents also depend on their school toilet for human faecal management.

Although respondents in urban basic schools with toilet facilities do not use the bush/uncompleted building as an alternative toilet, 15% (n=14) rural basic school respondents do. Nevertheless, in sampled schools without toilet facilities, 6% (n=6) urban student respondents and 4% (n=4) rural respondents indicated that they adopt the practice of defecating openly in the bush or uncompleted building. It therefore becomes evident from the study that out of 92 rural respondents, 20% (n=18) defecate in the bush/uncompleted buildings. The finding is close to the national average of 23% that uses the bush for defecation (GSS, 2009). It also confirms an earlier study by Nkrumah (2003) that uncompleted structures were used for open defecation. supports The finding that both urban and rural basic school students use alternative toilet because of poorly maintained and smelly conditions is supported by McGarry (1980). These smelly conditions can however be reduced through the incorporation of kitchen ash in excreta (Rybcynski, et al., 1978).

Findings on human faecal management in the study area have implications for psychological, mental and physical health of students. Students are likely to suffer from stressful conditions while waiting for their

turn to use limited toilet facilities in their respective schools. The practice is also likely to affect students' academic performance because associated uneasiness, prevailing smelly conditions and the possibility of missing a few lessons in class. In addition, defecation in the bush by students is likely to expose students in basic schools in the study area to risk of snakebites and other forms of danger. The finding that 6% (n=11) of urban and rural respondents cross busy roads because of the absence of a toilet facility in their schools further revealed the extent of exposure to risks. Although the study did not cover distance respondents cover in an attempt to use public toilets, near-by houses and the bush as toilet, the negative effects in terms of time wastage and inconvenience cannot be under estimated.

Furthermore, authors agree that unhygienic disposal of human faeces is responsible for a number of intestinal worm infections, viral infections like hepatitis, bacterial infections like typhoid, and protozoa infections like dysentery (Bradely, 1980; Nordberg 1999). Students in basic school in the study area are therefore likely to be exposed to these diseases due to inadequacies in human waste management facilities in terms of number and existing hygienic conditions.

Hypothesis on human faecal waste management in urban and rural basic schools revealed that there was no significant difference between urban and rural basic schools. Thus, the research hypothesis was rejected in favour of the alternative hypothesis that there is no significant difference between urban and rural basic schools in terms of human faecal waste disposal practices. This is indicative that shortfalls in human faecal waste management

disposal in urban and rural basic schools in the study area could be tackled by using similar approaches.

Environmental Clubs and Student Waste Management in Urban and Rural Basic Schools

It was revealed that neither urban nor rural basic schools in the study area had environmental/sanitation clubs. All 190 urban and rural student respondents indicated that they do not belong to environmental clubs and therefore did not name any environmental club when asked to do so.

Findings indicate that sampled schools do not use outdoor settings such as environmental related clubs and societies to teach environmental awareness issues. Many authors, (Anspaugh & Ezell, 1995; Otiende et al., 1997), are of the view that for Environmental Education to be sustainable, a multi-disciplinary approach including the use of outdoor setting such as clubs is required. Findings from the study however confirm an earlier survey by Addai (2007) that that environmental clubs were non-existing in schools in the Sunyani Metropolis. The non-existence of environmental clubs in the study area is however not a norm in Ghana. CDD- Ghana (2002) intimates that such clubs were formed in schools in Accra, Ghana, through the collaborative efforts of the Metropolitan Education Office. A study by Flynn and associate (2002) also revealed that school authorities are supportive of environmental initiatives taken by teachers.

Nevertheless, the absence of environmental/sanitation clubs in basic schools implies that students and for that matter the school community could not benefit from a peer-based co-curriculum environmental activities that could provide the community with environmental minded citizens in the

present and the future (Flynn, et al., 2002). Many authors agree that the absence of clubs and for that matter environmental clubs, denied students an exciting opportunity to explore, gather in-depth knowledge, use critical thinking skills and apply what they have learnt that will enable them shape their values, attitudes and practices towards environmental issues (Matthews & Rily, 1995; Attarian, 1996; Flynn, et al., 2002). Basic school environmental clubs could be made appealing to children and young youth if it is organised in line with Mathare Youth Sports Association that uses sports (football) as a motivation factor to promote community responsibility (Peters, 1998). The absence of environmental clubs in basic schools also rubs communities of clean ups and fund-raising for local environmental awareness programmes (EETAP, 2004).

Student-toilet ratio in Urban and Rural Basic School

Table 13 reveals that out the 10 sampled urban basic schools, 40% (n=4) have toilet seat that meets the GES requirement of student-ratio of 50:1. Three urban-based schools with student enrolment ranging between 178 and 480 do not have access to toilet facility in their school for students. Average student-toilet-ratio for sampled urban schools was 80:1.

It was also revealed that 40% (n=4) of sampled urban basic schools do not have any designated toilet facility for teachers and staff. Schools that have toilet facilities for staff use either WCs or KVIPs.

Table 13

Distribution of Toilet Facilities for Students in Urban Basic Schools

Schools	Enrolment	Type of Toilet	No. of toilet Seats	Student Toilet-ratio
1.Ho Anglican Prim	251	KVIP	8	32:1
2. Bankoe Meth. Prim.	256	KVIP	2	28:1
3. Bankoe E.P. Prim	480	NIL	0	0
4. Fiave E.P. Prim.	185	KVIP	2	93:1
5. E.P. JHS	285	NIL	0	0
6. Police Depot JHS	204	KVIP	10	21:1
7. Fiave SDA JHS	178	NIL	0	0
8. Alpha Int. School	112	KVIP	2	56:1
9. Prince Charles Int.	71	WC	2	36:1
10. Springs Complex	201	KVIP	2	101:1
Total	2,223		28	80:1

Table 14 on the other hand reveals that 40% (n=4) of sampled rural basic schools have toilet facilities for students that meet the GES's student-toilet seat ratio requirement of 50:1. Two rural based JHSs do not have toilet facilities for students. Average student-toilet-seat-ratio for sampled rural basic schools is 51:1.

The study also revealed that 60% (n=6) sampled schools have no designated toilet for teachers/staff. All four schools that have toilet facilities designated for staff make use of a KVIP for the purpose.

Table 14

Distribution of Toilet Facilities for Students in Rural Basic Schools

Schools	Enrolment	Type of Toilet	No. of toilet Seats	Student Toilet-ratio
1. Adaklu-Kpodzi E.P. Prim.	159	KVIP	6	27:1
2. Ziope R.C. Prim.	450	KVIP	8	60:1
3. Takuve L.A.Basic	147	KVIP	6	25:1
4. Akuetteh L. A. Prim.	102	KVIP	4	26:1
5. Akuetteh L. A. JHS	71	NIL	0	0
6. Adaklu-Anfoe JHS(Basic)	87	NIL	0	0
7. Adaklu-Torda JHS	326	KVIP	4	82:1
8. Ziope JHS	263	KVIP	8	33:1
9. Brilliant Academic Int.	95	Pit latrine	1	95:1
10. King Solomon Int.	306	Pit latrine	3	76:1
Total	2,006		40	51:1

It is evident from Tables 13 and 14 that out of 20 basic schools sampled, 20% (n=4) each of urban and rural basic schools met the GES require standard of 50 students to one toilet seat. However, average student-toilet-ratio for urban-based basic schools was 80:1as against 51:1 for their rural counterparts. The short fall in the GES recommended student-toilet-seat ratio is supported by Larbi (2006) that government (through CWSA) constructed only 2,200 school sanitation facilities as compared to 4,000 schools built from 2001 to 2005.

The findings thus disagree with the assertion by Sher (1981) that governments behave as though quality education and facilities should not be wasted on sparsely populated areas. Although GSS (2009) revealed a remarkable difference between urban and rural areas in terms of efficient and hygienic methods of human waste disposal, findings however revealed that rural basic schools in the study area have more toilet facilities than their urban counterparts. The existence of toilet facilities in all sampled rural primary basic schools irrespective of enrolment figures is indicative of the fact that rural basic schools students were not disadvantaged in terms provision of toilet facilities.

It was also observed that the only urban-based primary school which indicated that they do not have a toilet facility, had toilet facility for Kindergarten pupils. On the other hand, one rural basic JHS that indicated that they do not have a toilet also had one meant for kindergarten and lower primary school pupils. Since respondents were sampled from upper primary and JHSs, they could not indicate this because they do not access these facilities.

The absence of designated toilet for teacher and staff could result in teachers and other staff members making use of the limited facilities designated for students and pupils. DANIDA built KVIP toilets for public basic schools have no designation for teachers and staff. Nevertheless, teachers tend to ‘hijack’ one or two toilet seats and designate them for staff use. This practice could affect the intended GES student-toilet-seat ratio.

Many authors express their view on the effect of inadequacy in the provision of toilet facilities. McGarry (1980) intimated that inadequate or

poorly maintained toilet facilities encourage open defecation. Burras and associates (2003) in a study reported that children usually lose out to adults whenever there is pressure on the use of toilet facilities. Increase in the provision school infrastructure and student enrolment does not correspond with the provision of toilet facilities in basic schools in the study area.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This Chapter deals with the summary, conclusion and recommendations of the study.

Overview of the Study

The purpose of the study was to investigate whether environmental waste generated, waste management practices and facilities are the same in basic schools in Adaklu-Anyigbe District and Ho Township irrespective of urban-rural location of schools.

To achieve this purpose, a descriptive survey was conducted at Adaklu-Anyigbe District and the urban township of Ho using questionnaire. Some of the items of the questionnaire were modifications of items constructed by Sey (1998). The questionnaire was piloted using respondents from basic schools in the urban town of Dzodze and rural basic schools in Akatsi District. Based on the outcome of the pilot study, some items of the questionnaire were revised before the main study was conducted.

The population of the main study consisted of 98 urban basic school student respondents and 92 rural basic school student respondents. Simple random sampling was used to sample respondents for the study. A group of research assistants and I administered the questionnaire. One hundred percent

return rate was realised. The data were analysed by running a frequency and cross tabulation of urban and rural students as well as school authorities' responses on student waste management practices in the study area. This was done by taking a research question and a hypothesis at a time for analysis. A Chi-Square test of independence was performed to test for any significant difference between responses of urban and rural students and school authorities.

Summary of Findings

The study therefore revealed the following:

1. While plastics, paper products and animal droppings were the main forms of refuse, industrial waste materials in the form of discarded computers, TV, aluminium and metal scrubs constitute the least type of refuse in urban both rural basic schools.
2. There was high incidence of inadequacies of facilities for the collection and disposal of refuse by students in both urban and rural basic schools in the study area.
3. Whereas no rural-based student dispose of waste into dustbins for non-students to carry to dumpsite, only one urban-based primary public school had access to this facility for students' use
4. Both urban and rural basic school students in the study area do not use composting as a deliberate method of waste disposal.
5. In terms of human faecal waste management facilities, rural basic school students were exposed to the use of more facilities than their urban counterparts were. While average student-toilet-seat ratio for rural students in the study area was 51:1, that for their urban

counterparts was 81:1. Nevertheless, four sampled schools each from urban and rural basic schools in the study area met the G.E.S student-toilet-seat ratio requirement of 50:1.

6. Although the use of the KVIP was predominant in urban and rural public schools, some urban private school students were also exposed to the use of WCs while their rural counterparts depended solely on pit latrines.
7. While 28% (n=28) urban sampled respondents do not have access to toilet facilities in their schools, only 14% (n=13) rural counterparts do not.
8. Environmental/sanitation clubs were non-existing in urban and rural basic schools in the study area.

Conclusions

The following are conclusions arrived at from the study:

1. The presence of both biodegradable materials in the form of paper products and animal droppings and non-biodegradable waste materials like industrial scraps and plastics in the waste stream of both urban and rural basic schools is an indication that composting of waste could be undertaken in basic schools. This can be effective following the introduction and effective implementation of a-waste-sorting programme.
2. Refuse generation and management practices in urban and rural basic schools was likely to expose inmates of basic school communities to health hazards. This is because inadequacies in refuse collection facilities, disposing refuse on school premises coupled with rampant

burning has the potential of exposing students to diseases. The confirmation of the research question by findings that there was no difference between urban and rural basic schools in terms of refuse management practices is an indication that both are likely to be exposed to the same level of risk.

3. The absence of environmental/sanitation related club(s) in both urban and rural basic school in the study area was an indication that waste management practices adopted by students was not influenced by environmental club activities. The prevailing situation has the tendency of denying students the exposure to environmental values, attitudes and skills that could be acquired for the present and future sustainable management of the environment.
4. In term of the provision of toilet facilities for private, primary and JHSs in the study area, JHSs were the most disadvantaged.
5. The prevailing shortfalls in the provision of toilet facilities in urban and rural basic schools to meet the G.E.S. student-toilet-seat ratio of 50:1 is likely to worsen in the study area because of interventions by government aimed at improving basic school enrolment. The introduction of the Capitation Grant, free school uniform and feeding programme have the tendency of increasing student enrolment in the coming years.

Recommendations

The following recommendations are offered:

1. Education policy makers, administrators and basic school authorities should put in place measures that will enable basic school students

separate wastes into components of biodegradable and non-biodegradable. School authorities should subsequently assist students to adopt composting as a method of waste management in their respective schools.

2. Education policy makers, Metropolitan and District Directorates of Education should put in place measures that will disallow the burning of refuse especially plastic and electronic wastes anyhow by students on school premises.
3. Metropolitan and District Directorates of Education, School Management Committees (S.M.Cs), Parent Teacher Associations (PTAs) and school authorities of basic schools should put in place measures that will enable basic school students have enough and adequate facilities for the disposal of refuse.
4. Metropolitan and District Directorate of Education must put in place measure that will ensure that Environmental/sanitation clubs are formed in urban and rural basic schools in the study area. Such a club must be organised in line with Mathare Youth Sports Association by incorporating collection of garbage, and clearing drainage systems with sports (football) into its activities to make environmental club activities attractive to young children and the youth.
5. Further comparative studies on waste management practices of urban and rural-based communities and school in Ghana is recommended.

REFERENCES

Addai, R. (2007). *Environmental Education in Senior Secondary Schools in the Sunyani Municipality*. Unpublished M.A. dissertation, University of Cape Coast: Cape Coast.

Agbola, T. (1993). Environmental Education in Nigerian Schools. Filho, W. L. (Ed.). *Environmental Education in the Commomwealth* (pp. 23-50) Vancouvre: The Commonwealth of learning.

Ahove, M. A. N. (2000). *Enhancing Environmental Education Research Developing and Validating Students cultural Belief Inventory Using Secondary Schools in Western Nigeria.* Paper read at 41st Annual Conference Proceedings of the Science Teachers Association of Nigeria, at Kano, Nigeria.

Anderson, G. (1996). *Fundamentals of Educational Research.* New York: Falmer Press.

Annoh, C. & Mainoo, G. (1994). *Public and private sector management of solid waste in Accra; Performance Evaluation*, Accra.

Anspaugh, D. J. & Ezell, G. (1995). *Teaching Today's Health* (4th ed.). Boston: Allyn and Bacon.

Armah,N. A. (1992). *Waste Management and the Environment.* Paper presented at environmental seminar by SGS Ghana Limited, Accra.

Arthur, E.K (1981). *Teaching and learning Elementary social studies* (2nd Ed.). Allyn and Bacon Inc Boston.

Atsuko, T., Takehito, T., Keiko, N. & Sachiko, T. (1996). Health levels influenced by *Residential* conditions in a Megacity-Tokyo. *Urban Studies,* (3) 6.

Attarian, A. (1996). Integrating values clarification into outdoor adventure programs and activities. *Journal of Physical Education, Recreation & Dance*, 67 (8) 41-44.

Azen, I. (2001). Nature and Operation of attitudes. *Annual Reviews in Psychology*, 52, 27-58.

Ballantyne, R. (1998). Interpreting 'visions': Addressing environmental education goals through interpretation. *Contemporary Issues in Heritage and Environmental Interpretation*. pp 77-97. London: Stationery Office.

Ballantyne, R. & Packer, J. (1996). Teaching and Learning in Environmental Education: Developing environmental conceptions. *Journal of Environmental Education*, 27 (2) 25-32.

Best, J. W. & Kahn, J. V. (1998). *Research in Education*. Allyn and Bacon, Needham Heights, M.A. 012194.

Boakye, A. (2006). *Attitude of teachers towards the use of Instructional time in Public Primary Schools in Kwabre District in Ghana.* Unpublished M. Phil. Theses University of Cape Coast, Cape Coast.

Bradley, C.J., Waliczek, T.M. & Zajicek, J.M. (1999). Relationship between Environmental Knowledge and Environmental Attitude of high school students. *Journal of Environmental Education,* 30 (3) 17-21.

Bradley, J. D. (1980). Health aspects of water supply in tropical countries, *Water, Waste and health in Hot Climate* Faechem, R. et al. (Eds) New Jessey.

British Medical Association (1998). *Health and Environment impact Assessment: an Integrated Approach*, London: Earthscan Publication Limited.

Booth, B., Martin, K & Lankester, T., (2001). *Urban Health and Development, A Practical manual for use in Developing countries*, Macmillan, Publishers.

Bordens, S. K. & Horowitz, I. A. (1995). *Social Psychology,* California: Mayfield Publishing Company.

Burras, S., Patel, S. & Kerr, T. (2003). Community-Designed, built and Managed toilet Blocks in Indian cities. *Environment and Urbanization*, 15 (2) 11-32.

Caneer, B. (1997). *What Recycling means to me? Survey at the Marshall Space Flight Centre.* Retrieved on July 2009, from http; www. Recycle. cfc.nasa.gov/survey/survey

Canfield, R. L., Henderson, C. R. Jr., Cory-Slechta, D. A. , Cox, C. , Jusko, T. A. , & Lanphear, B. P.(2003). Intellectual impairment in children with blood lead concentrations below10 microg per decilitre . *New England Journal of Medicine,* 348, 1517–1526.

Centre for Democratic Development, Ghana (2002). *Sanitation in Accra, Ghana.* Report on Proceedings on public hearing on Sanitation in the City of Accra by the Committee on Local Government and Rural Development, Parliament of the Republic of Ghana.

Centers for Disease Control (1991). *Preventing Lead Poisoning in Young Children.* Atlanta, GA: Centers for Disease Control. Retrieved July 2009, from:http://wonder.cdc.gov/wonder/prevguid/

Crump, A. (1991). *Dictionary of Environment and Development. People, Places Ideas and Organization.* London: Earthscan Publication Limited.

Cuningham, W. P., Cuningham, A. M., & Saigo, W. B. (2005*). Environment Science: A Global Concern* (8th ed.), Boston, McGsraw Hill Company.

Davison, A. R., Yantis, S., Norwood, M. S. & Montano, D. E. (1985). Amount of information about the Attitude Object and Behaviour Consistency. *Journal of Personality and Social Psychology*, 49, 1184-1198.

De Swardt, C., Puoane, T., Chopra, M. & Du Toit, A. (2005). Urban poverty in Cape Town. *Environment and Urbanization.*

Donnellan, C. (2000). *Waste and Recycling*, Cambridge: Independent Education Publishers.

Duncan, J. W. K., (1996). Sewage and Refuse Disposal systems in Africa *Principle and Practice of Public health in Africa*. Sofoluwe G. O.et al (Eds). Ibadan, University Press PLC (vol.1), p. 162- 173.

Eagles T., & Demare, R. (1999). Factors Influencing Children's Environmental Attitudes. *Journal of Environmental Education* 30(4), 33.

Environmental Education and Training Partnership (2004). *How Environmental Education is used in Schools; Environmental Education and Training Partnership*. Retrieved July 2009, from www.eelink.net

Enger, E. D & Smith, B. F, (1992). *Environmental Service: A study of Interrelationship.* (4th ed.), Dubuque: Wm Co. Browy.

Environmental Protection Council (1992). *Ghana Environmental Action Plan*, Vol. 1, Accra: State Publishing.

Environmental Protection Council (1994). Ghana Environmental Action Plan Vol. 2, Accra State Publishing.

Essumang, D. K. (2000). *The effects of leachate from Solid Waste Disposal sites on the Cape Coast Municipal Environment.* Unpublished M. Phil. thesis, University of Cape Coast, Cape Coast.

Flynn, T., Berry, S., Saker, C., Kavanaugh, S. & Currie, T. (2002) Environmental Clubs at Elementary Schools *ERS 250.*

Fobil, J. N. & Hogarh, J.N. (2006). The Delimas of Plastic Wastes in a Developing Economy: Proposals for a Sustainable Management Approach for Ghana, *West African Journal of Applied Ecology*, 10 221-229.

Fraenkel, J. R. & Wallen, N. E. (2000). *How to design and evaluate research in Education* (4th ed.), New York: MacGraw Hill Company.

Gall, M. D., Borg, W. R. & Gall, J. P. (1996). *Educational Research: An Introduction* (6th ed.), Oregon: Longman Publishers.

Gallopin, G .C., Gutman, P. & Maletta, H. (1989). Global Impoverishment, Sustainable Development and the environment: a conceptual approach. *International Social Science Journal*, 121 (3), 375-398.

Gay, R. L. (1987). *Educational Research Competencies for Analysis and application* (3rd ed.), Colombus Ohio: Merril Publishing Company.

Ghana Statistical Service (2009). *Ghana Demographic and Health Survey 2008.* Maryland: ICF Macro.

Ghana Statistical Service (2002). *2000 Population and Housing Census Report,* Accra: Ghana Publishing Co.

Gilpin, A, (1980). *Environmental Impact Assessment: cutting edge for the Twenty first century,* Cambridge: Cambridge University Press.

Goldsmith, E. & Hildyard, N. (1988). *The Earth Report. Essential Guide to Global Ecological Issues.* Los Angeles C.A: Price Stern Sloen Inc.

Glazar, S. A. Vrtacnik, M. & Bacnik, E. (1998). Primary School children's Understanding Of Municipal Waste Processing *Environmental Education Research,* 4 (3), 299-309.

Government of Ghana (1993). Local Government Development Project; preparation of simple development plans and infrastructure. Programme in selected towns vol.1. *Summary Reports on findings and recommendations applicable to all settlements.* Pp 23.

Gray, M. J. (1997). Environmental Policy and Municipal waste Management in the U.K *Transactions of the of British Geographers* 22 (1), 69-90.

Grigg, J. (2004). Environmental toxins: their impact on children's health. *Arch Dis Child,* 89, 244–250.

Grodzinska-Jurczak, M., Bartosiewicz A., Twardowska, A. & Ballantyne, R. (2003). Evaluating the impact of school waste Education programme upon students, *International Research in Geographical and Environmental Education,* 12 (2), 806-121.

Grodzinska-Jurczak, M. (2001). Management of Industrial and Municipal Solid Waste in Poland. *Resource, Conservation and Recycling,* 32 (2), 85-103.

Gupta,A.K. (2006). *Hand book of Health Education and Community Pharmacy.* New Delhi: CBS Publishers and Distributors.

Hardoy, J. & Satterthwaite, D. (1992). *Environmental Problems in Third World Cities*. London: Earthscan.

Harrison, P., (1993). *The Third Revolution: Population Environment and Sustainable World,* London: Penguin Book Limited.

Hodgson, I. & Larmie, S. A. (1999). Sewage Seepage and Faecal Sludge Management in Tamale Municipality of Ghana *Journal of Applied Science and Technology* (JAST), 4, 67-71.

Howe, R. & Disinger, J. (1988). Teaching environmental education using the out-of- school settings and mass media. ERIC/SMEAC *Environmental Education Digest*, No. 1. Washington, DC: Office of Educational Research and Improvement. (ERIC Document Reproduction Service No. ED 320 759).

Huo, X., Peng, L., Xu, X., Piao, Z., Zheng, L., Qiu, B. Qi, Z., Zhang, B. & Han, D. (2007). Elevated Blood levels of Children in Guiyu, an Electronic recycling Town in China. (Electronic version) *Environmental Health Perspectives*, 115. Retrieved July, 2009 from http://dox.doi.org/

International Institute for Environmental Development, (1992). *Environmental Synopsis of Ghana*, Nottingham: U.K.

Jang, Y. C. & Townsend, T. G. (2003). Leaching of lead from computer printed wire boards and cathode ray tubes by municipal solid waste landfill leachates. *Environmental Science Technology*, 37, 4778–4784.

Johnson, J. (1990*).* Waste that no one wants. *New Scientist,* 127 (1733), 50-52.

Johnson, T. (2006). *E-waste* dump *of the world*. Retrieved July 2009, from http://seattletimes.nwsource.com/html/nationworld/2002920133-ewaste.

Kendie, S.B. (1990). The state of Rural Sanitation in Ghana. *Oguaa Social Science Journal* 1 (1), 31-40.

Knapp, C. E. (1996). *Just beyond the classroom: Community adventures for interdisciplinary learning.* Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools. (ERIC Document Reproduction Service No. ED 388 485.

Kola-Olusanya, A . & Ahove, M. A. N. (n d). *Effects of Environmental Education on African School Children's Waste Disposal.*

Kotey, V .D. (1998). *Attitude towards Environmental Degradation of the Cape Coast Beach.* Unpublished dissertation, University of Cape Coast, Cape Coast.

Kundu, C. L. & Tutoo, D. W. (1988). *Educational Psychology,* New Delhi: Sterling Publishers.

Larbi, E. (2006*). Sanitation in Ghana*. Paper on current sanitation situations in Ghana.

Leeming, F. C. (1997). Effects of Participation in class Activities on Children's Environmental Knowledge, *Journal of Environmental Education*, 28 (2), 33-42.

Lehman, I. J. & Mehrens, W. (1991). *Measurement and Evaluation in Education and Psychology* (4th ed.), Philadelphia: Harcourt Brace College Publishers.

Lomborg, B. (2001). *The Skeptical Environmentalist: Measuring the Real State of the World.* Cambridge: Cambridge University Press.

Matthews, B. E., & Riley, C. K. (1995). *Teaching and evaluating outdoor ethics education programs*. Vienna, VA: National Wildlife Federation. (ERIC Document Reproduction Service No. ED 401 097.

McGarry, M. (1980). Waste Collection in Hot Climates: Technical and Economic Appraisal: *Water, Waste and Health in Hot Climate*, Feachean, R. (Ed.). New York: John Wiley and Son.

Mckenzie, J. P. & Pinger, R. R. (1997). *An introduction to Community Health*, Jones and Barlett Publishing Inc.

Munro, B. (1992). A new approach to youth activities and environmental clean-up: The Mathare Youth Sports Association in Kenya. *Environment and Urbanization*, 4 (2), 207-209.

Musson, S. E., Vann, K. N., Jang, Y .C., Mutha, S., Jordan, A. & Pearson, B. (2006). RCRA toxicity characterization of discarded electronic devices. *Environmental Science Technology*, 40, 2721–2726.

Nadakavukaren, A. (1990). *Man and Environment: Health Perspective* (3rd ed.). Illinois: Prospect Heights Inc. Waveland Press.

National Safety Council (1999). *Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic Products in the United States*. Wa shington, DC: National Safety Council, Environmental Health Centre.

Nevin, R. (2000). How lead exposure relates to temporal changes in IQ, violent crime, and unwed pregnancy. *Environmental Responsibility,* 83, 1–22.

Newell, J. (1990). Recycling Britain, *New Scientist,* 127 (1733), 46-49.

Nkrumah, M.K. (2003). Health Implication of water utilization in Cape Coast Municipality: Quantity-Quality Dimensions *The Oguaa Journal of Social Science,* 4, 15-134

Nordberg, E. (Ed.). (1999*). Communicable Diseases: A Manual for Health Workers in Sub-Saharan Africa.* Nairobi: African Medical and Research Foundation.

Obeng, L., (1980). *Environment Management and the responsibility of the privileged,* Accra: Ghana Academy of Arts and Sciences.

Oluwande, P.A. (1996). Environmental Health for Rural Areas: Principles and Practice in African. *Principles and Practice of Public Health in Africa,* Sofoluwe G.O. et al. (Eds.). Ibadan: University Press.

Open University, (1993). *Environmental Control and Public Health,* Walton Hall: Milton Keyees.

Osuala, C. (2001). *Introduction to Research Methodology,* Onitsha: Africa-F.E.P. Publishers.

Otiende, J. E., Ezaza, W. P. & Boisvert, R. (Eds.). (1997). *An Introduction to Environmental Education*. Nairobi: Nairobi University Press.

Palmer, J.A. (1995). Environmental thinking in the early years: Understanding and misunderstanding of concepts related to waste management. *Environmental Education Research,* 1 (1), 35-45.

Park, C. (1980*). Ecological and Environmental Management: A geographic perspective,* London: Butterworth.

Parkinson, J. & Tayler, K. (2003). Decentralized Wastewater Management in Peri-Urban areas in low in-come Countries *Environment and Urbanization,* Nottingham: Russell Press.

Peters, K. (1998). Community-Based Waste Management for Environmental Management and Income Generation in Low-income Areas: A Case Study of Nairobi, Kenya. *Urban Agriculture Notes.*

Piotrow, P. T., Kincaid, D. L., Rimon, J. G. & Rinehart, W. (1997). *Health Communication.* London: Praeger.

Phillips, R.D. (1990). *Health and Health Care in the third world*, New York, Wiley and Sons Inc.

Prislin, R. & Quellette, J. (1996). When it is embedded, it is potent: effects of general attitude embededness on formation of specific attitudes and behaviour. *Personality and Psychology Bulletin,* 22 (8), 845-861.

Puckett, J. (1994). Disposing of the Waste. *The Ecologist*, 599-630.

Ramsey, J. M., Hungerford, H. R. & Volk. T, L, (1992). Environmental education in the K-12 curriculum: Finding a niche. *Journal of Environmental Education,* 23 (2), 35-45.

Rawlings, J. J. (1995). *Ghana Vision 2020 (the first step: 1996-2000).* Presidential Report on Co-ordinated Programme of Economic and

Social Development Policies for the preparation of the 1996-2000 Development Plan, p 5-8.

Read, A. D., Hudgins, M. & Phillips P. (2001). Aerobic Landfill test cells and their implications for sustainable waste Disposal. *The Geographical Journal,* 167 (30), 235-247.

Redican, K. Olsen, L., & Baffi, C. (1993). *Organization of School Health Programs,* Wisconsin, Wm. C. Brown Communication Inc.

Rybczynski, W., Polprasert, C. & McGarry (1978). *Low-Cost Technology Options for Sanitation: A state -of- the-art review and annotated bibliography.* Ontario: International Development Research Centre.

Sappor, D. K. (2005). *Evaluation of Municipal Household Solid Waste in Cape Coast for Soil Fertility Improvement.* Unpublished M. Phil. thesis. University of Cape Coast, Cape Coast.

Schell, L. M. & Ulijaszek, S. J. (1999). *Urbanism, Health and Human Biology in Industrialise Countries.* Cambridge: Cambridge University Press.

Schmidt, J. E. (2007). From Intentions to Action: The role of environmental Awareness on College Students. *UW-L Journal of Undergraduate Research X.*

Schnaas, L., Rothenberg, S. J., Flores, M .F., Martinez, S., Hernandez, C. & Osorio, E. (2006). Reduced intellectual development in children with prenatal lead exposure. *Environmental Health Perspectives,* 114, 791–797.

Scott, D. & Usher, R. (1996). *Understanding Educational Research*. London: Routledge.

Sey-Ankoma, B. L. (1998). *Assessment and Comparison of Environmental Education in Central Region in Ghana.* Unpublished thesis, University of Cape Coast, Cape Coast.

Sey-Haizel, S. (1999). *Funding Waste Management in the Cape Coast Municipality.* An unpublished thesis. University of Cape Coast. Cape Coast.

Sher, J. P. (Ed.). (1981). Education in the Countryside: Establishing the Context. *Rural Education in Urbanized Nation Issues and Innovations.* Colorado, Westview Press Inc.

Songsore, J. (1999). Urban Environment and Human well-being: The case of Greater Accra Metropolitan Area, *Ghana Bulletin of the Ghana Geographical Association*, 21, 28-32.

Solstad, J. K. (1981). Locally relevant curriculum in Rural Norway: the Lofoten Island Examples. *Rural Education in Urbanized Nations: Issues and Innovation,* Colorado: Westview Press Inc.

Sprinthall, N. A., Sprinthall, R.C. & Oja, S.N. (1994). *Educational Psychology: A developmental approach* (6th ed.) New York: McGraw Hill.

Stren, R. (1991). Old wine in new bottles? An overview of Africa's urban problems and the "urban management" approach to dealing with them. *Environment and Urbanization*, 3 (1), 9-22.

Tamakole, E. K. (1991). The nature of social studies and its curricular implications *Journal of Institute of Education*, 2, 41 -49.

Tikka, P. M., Kuitunen, M. & Tynys, S.A.(2000). Effects of educational background on students' attitudes, activity levels and knowledge concerning the environment. *Journal of Environmental Education,* 31(3), 12.

Tuckman, B. (1975). *Measuring Educational Outcomes: Fundamentals of Testing.* New York: Harcourt Brace Jovanovich, Inc.

United Nations Development Programme (1998). *Human Development Report.* New York: Oxford University Press.

United Nations Environment Programme (UNEP) (2006). Parties to the Basel Convention. Secretariat of the Basel Convention,(Electronic version) *United Nations Environment Programme*. Retrieved July 2009, from http://www.basel.int/ratif/convention.htm.

United Nations Education, Scientific and Cultural Organization (1978). *First Intergovernmental Conference on Environmental Education: Final Report Tbilisi,* USSR. Paris: UNESCO.

USA Today, (2002). *Much toxic computer waste lands in Third World*. Retrieved July 2009, from http://www.ustoday.com/tech/news/waste.htm .

Van Burren, J. C. L. & Dieu, T. M. (2009*).* Fertilizing the Market, Biowaste reuse in South-east Asia. (Electronic version). *Waste Management World,* 10 (2) March/April. Retrieved July 2009, from http://www.waste-management-world.com.

Wiesma, W. (1980). *Research Methods in Education* (3rd ed.). Toledo: T.E. Peacock Publishers Inc.

Williams, L. K. & Langely R. L. (2001). *Environmental Health Secrets*, Philadelphia: Hanely Belfus, Inc.

Wood, C. H., de Glanville, H. & Vanghan, J. P. (1997). *Community Health,* (2nd ed.). Nairobi: African Medical and Research Foundation.

World Bank, (1992). *Sanitation and Water supply: practical Lessons from the Decade*. Washington D.C., World Bank.

World Bank, (1994). *Rapid Urban Environmental Assessment*, Washington D.C.: World Bank.

World Bank (1998). *Pollution Prevention and Abatement Handbook 1998.* Washington D.C. W.B.

Wortman, C. B., Loftus, E. F. & Marshall, M. E. (1992). *Psychology* (4th ed.). New York: McGraw Hill Inc.

Zanna, M. P. & Rempell, J. K. (1988). *Attitude: A New look at an old concept*. New York: Cambridge University Press.

APPENDIX A

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION UNIVERSITY OF CAPE COAST

QUESTIONNNAIRE FOR URBAN AND RURAL STUDENTS

Dear student,

You are one of the students selected to respond to questions on Waste Management attitudes and practices of students in basic school in Adaklu-Anyigbe District and Ho Township. Please provide honest response in your view on the issues raised.

SECTION A

BACKGROUND

1. I am in Basic

[ ] Five

[ ] Six

[ ] Eight

[ ] Nine

2. Age..... years old

3. Sex

[ ] Male

[ ] Female

SECTION B

REFUSE GENERATION AND DISPOSAL

4. Polythene materials like polythene and pure water bags are found in my school.

[ ] Yes

[ ] No

5. Paper and paper products can be found in my school.

[ ] Yes

[ ] No

6. Food leftovers can be found on my school compound.

[ ] Yes

[ ] No

7. Industrial materials like discarded computers, TV, aluminium and metal scrubs can be found in my school.

[ ] Yes

[ ] No

8. Do you sometimes find Agricultural waste materials like droppings of goats, sheep and fowls in your school?

[ ] Yes

[ ] No

9. Do you sometimes find human faeces in your school compound?

[ ] Yes

[ ] No

10. Facilities for the collection and disposal of refuse in my school is

[ ] adequate

[ ] inadequate

11. Where do you put rubbish or waste materials in your school?

[ ] Gutter/anywhere on the compound

[ ] Dug hole/dump site within the school

[ ] Dust bin for carriage by non students

[ ] dump site outside the school

[ ] Other.

Specify.....

12. Waste or rubbish generated in my school is burnt within the school.

[ ] Yes

[ ] No

13. How often is waste or rubbish generated in your school burnt?

[ ] Always

[ ] Sometimes

[ ] Never

14. Do you belong to an environmental or Sanitation Club?

[ ] Yes

[ ] No

15. If your answer to Q14 is YES, name the club(s).

.....

[ ] Not Applicable (NA)

SECTTION C

HUMAN FAECAL WASTE GENERATION AND DISPOSAL

16. Does your school have its own toilet facility?

[ ] Yes

[ ] No

17. Which one of these do you usually use as toilet facility in your school?

[ ] KVIP

[ ] Water Closet

[ ] Pit Latrine

[ ] Pan Latrine

[ ] NA

[ ] Other.

Specify .....

18. How often do students have to wait before using toilet facilities in your school?

[ ] Always

[ ] Sometimes

[ ] Never

[ ] NA

19. While in school have you ever used a toilet facility apart from the one in the school?

[ ] Yes

[ ] No

[ ] NA

20. While in school, one type of toilet you use apart from the one in the school is

[ ] Public toilet

[ ] Bush/uncompleted building (free range)

[ ] My house/a house near by

[ ] None

[ ] NA

[ ] Other.

Specify.....

21. Why did you decide to use this toilet (Q20) other than the one in the school?

[ ] The one in the school was smelly

[ ] The one in the school was dirty

[ ] The toilet in the school was not enough

[ ] My house is close to the school

[ ] I don't like the one in the school

[ ] NA

[ ] Other. Specify .....

22. If your school does not have its own toilet, what facility do you use while in school?

[ ] Public toilet

[ ] Bush/uncompleted building

[ ] My house/a house near by

[ ] I have never used any toilet facility while in school

[ ] NA

[ ] Other.

Specify.....

APPENDIX B

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

UNIVERSITY OF CAPE COAST

QUESTIONNNAIRE FOR SCHOOL AUTHORITIES OF SAMPLED SCHOOLS

Name of School .....CIRCUIT.....

1. Which of these methods do students in your school use to dispose of refuse?

[ ] Burning/Incineration

[ ] Composting

[ ] Local landfill

[ ] Throw rubbish anywhere

[ ] Recycling

[ ] Other

2. Old refuse heaps are later used by students on the school farm or garden as fertiliser.

[ ] YES

[ ] NO

3. Which type of rubbish or waste is mostly re-used by students in your school?

[ ] Decomposed material from refuse dumps

[ ] Animal droppings

[ ] Human faeces

[ ] Discarded aluminium waste

[ ] Plastic materials

[ ] None

[ ] Other

4. Do students/pupils in your school re-use plastic materials during lessons or any other time?

[ ] YES

[ ] NO

5. Students/pupils in your school re-use aluminium by-products.

[ ] YES

[ ] NO

6. Does your school have toilet facilities that are in use for students/pupils?

[ ] YES

[ ] NO

7. What type of toilet facility do students use in your school?

[ ] KVIP

[ ] WC

[ ] Pit Latrine

[ ] Pan Latrine

[ ] None

8.10 Does your school have an environmental/sanitation club?

[ ] YES

[ ] NO

9. If your response to Q8 is "YES", please name the club.

. .....

10. What type of toilet facility do teachers /staff in your school use?

[ ] KVIP

[ ] WC

[ ] Pit Latrine

[ ] Pan Latrine

[ ] No toilet for teachers/staff

11. Number of individual toilet seat in use in your school for students/pupils is

.....

12. Number of toilets in use by staff/teachers is

.....