Assessment of the Effects of Solid Waste Disposal on the Biophysical Environment in Some Selected Secondary Schools: A Case Study of Gwagwalada Area Council FCT, Abuja

[1]Menwo Ukechi Osigwe, PhD, [1]Oruonye, E.D. PhD, [1]Tukura Ejati Danladi and [2]Sarah Maurice Tahumma

[1]Department of Geography, Taraba State University Jalingo, Nigeria.
[2]Directorate of Aerodrome and Airspace Standards (DAAS) Operations Unit, Nigerian Civil Aviation Authority (NCAA), Abuja Regional Office.

Abstract

Inappropriate solid waste management practices in schools in developing countries constitute one of the major factors leading to declining environmental health conditions. A proper waste management is needed to ensure the protection of the environment and human health. Few studies have captured waste management problems in Nigerian educational institutions, particularly the views of students. This study was designed to assess the effects of solid waste disposal on the biophysical environment of secondary schools in Gwagwalada Area Council of Federal Capital Territory (FCT), Abuja. Using a structured, self-administered questionnaire, eight (8) schools were randomly sampled from which fifty (50) students were selected from each school. A total of four hundred (400) students were surveyed. However, only three hundred and fifty eight (358) of the returned questionnaires were found to be completely filled and were used for the analysis. Data collected were subjected to percentage; mean, standard deviation, correlation and chi-square statistical analyses. Findings revealed that the level of knowledge, attitude and practice of waste management was relatively moderate in secondary schools in Gwagwalada Area Council, FCT-Abuja. The percentage of those who used indiscriminate solid waste disposal methods like open dumping and open burning was higher. Educational status, age and gender, among others, were factors influencing relationships that were observed between students' sex, age and class and their level of awareness, knowledge and practices of waste management.

Keywords: Developing countries, Environmental health conditions, Nigerian educational institutions, Solid Waste and Waste Management Practices.

Introduction

One of the greatest problems facing developing countries is the unhealthy disposal of solid wastes which resulted from human activities for survival (Osinowo, 2001 and Joseph, 2006). The poor state of waste management in the country is caused by inadequate facilities, poor funding, and poor implementations of policies as well as wrong lifestyle of the people, economic development, urbanization, improved living standards in cities, and increase in enrolments of school children due to government policies in developing countries, increase the quantity and complexity of generated solid waste in schools. If this waste is accumulated, it may lead to

degradation of the urban environment, stresses on limited natural resources, and various health issues. Globally, most public schools are facing high level of pollution due to inadequate waste disposal in the environment.

The situation in developing countries such as Nigeria is more acute, partly because of the lack of adequate solid waste disposal facilities and people's negative attitude towards the environment. There is strong evidence which suggests that individual or group awareness and attitudes towards waste generation and management is critical in the effort to respond to the waste management challenges (Kofoworola, 2007). The negative attitude of the society towards solid waste disposal on the environment also affected the educational institutions whose problem has been aggravated by constant changes, not just in curriculum content but also school subjects. For example, health education as school subject has been replaced by hygiene where students were once taught sanitation of the environment, which provides opportunity through which the act of waste management and sanitation could be learnt (Ogunyemi, 1994; Adara, 1997; Ifegbesan, 2010). The awareness, attitudes and behaviors of people in the community are crucial to the management of waste. Reasons for individual participation in management of waste are related to environmental motivation, social pressures, attitudes and economic incentives (Bartlett, 2005). Problems with waste management have arisen recently in developing countries where there is a little history of environmental awareness education (Ojeda et al, 2000) and where many members of the community are illiterate and unaware of the problem of solid waste accumulation.

Environmental attitude of young people appears to be crucial as they ultimately play a direct role in providing knowledge-based solutions to in- coming environmental problems (Eagles and Demare, 1999). School environmental programs, although addressed to students if properly channeled can also influence the environmental knowledge, attitude and behavior of adults (parents, teachers and local community members) through the process of intergenerational influence (Evans et al, 1996; Ballantyne, 1998; Gallagher et al., 2000). Every school generates waste arising from routine activities such as class work, sweeping, serving of food, and bush cutting. The common types of solid wastes found in various schools in developing countries include paper, grass, nylon (pure water bags and biscuits, lollypops, ice cream, and sweet or candy wrappers), sugar cane, maize cobs, and groundnut shells. Other forms of wastes may also be found on school premises, and these may not have even been generated directly by pupils and teachers. Age, gender, educational status, and amount charged for waste collection services had been identified as factors influencing solid waste management in highly populated cities like Ibadan and Lagos.

At the dawn of the 21st century, a powerful and complex web of interactions has contributed to unprecedented global trends in environmental degradation. These include rapid globalization, urbanization, poverty unsustainable consumption patterns and population growth. They have served to compound the effects and intensity of the global environmental problems. Global climate change, depletion of the ozone layer, desertification, deforestation, loss of the planet's biological diversity, trans-boundary movements of hazardous wastes and chemicals are all environmental problems that touch every nation and adversely affect the lives and health of their populations.

The level of global environment challenges is now beyond serious scientific dispute. In cognizance of the role of an informed and educated citizenry in making appropriate environment decisions and adopting behavioral approach in addressing environmental challenges, the concept

of Environmental Education (EE) was born. The importance of Environmental Education (EE) is recognized and emphasized as one of the most effective ways, if not the only way, to meet the complicated problems of the environment. The call for environmental education is therefore a call for local, regional and global action in response to the biophysical and social problems of the abused environments of the whole world. It is a call to educational system that fosters or encourages the development of environmentally literate citizens who share concern for the environment in which they live and in which generations will also have to live.

The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 reiterated, in Agenda 21, that through environmental education, school children are obliged to participate actively in guarding the quality of the environment. This is because they comprise half of the world population and are highly vulnerable to the effects of environmental degradation now and in the future. Moreover, secondary school students are usually receptive and strongly motivated and are capable of understanding the implications of environmental destruction and of trying to take preventive action. However, for school children to meaningfully participate in environmental conservation activities, they require knowledge and skills gained through environmental education. These qualities are personal thought, feeling and action which develop in the students through an educational process that creates awareness, develops attitude and builds capacity and willingness to take action as an individual and as a group. Gwagwalada is one of the Area Council in the Federal Capital Territory (FCT) of Nigeria. It has an area of 1,043km and a population of 157,770 according to the 2006 census. It is referred to as the industrial heartbeat of FCT, Abuja.

Unarguably, one of the main problems facing Gwagwalada Area Council Secondary Schools and which has become an intractable nuisance is pen and indiscriminate dumping of refuse, human and animal faeces. Piles of decaying garbage which are substantially domestic in nature dominate strategic locations in the heart of the town. Wastes in such dump sites obviously are sources of air and water pollution, land contamination, health hazards and environmental degradation. Regrettably, this condition characterizes environmental culture in Gwagwalada. It is important to note that endangered public health situation can exert excessive pressure on the health budget, curtails productivity and worsens urban condition of health aesthetic value of the environment. This ugly situation persisted for decades because of the high rate of illiteracy, ignorance, uncivil culture of indiscriminate waste littering and other factors. Keeping all this in view, the present study was designed to assess the effects of the solid waste disposal on the biophysical environment of secondary schools in Gwagwalada Area Council, Abuja.

Statement of Research Problem

Taken into cognizance the inevitability of waste in the environment, effective disposal and management of wastes must be given priority in the planning of every society, to ensure sustainable environment given present scientific, economic, social and political constraints. However, ineffective waste disposal litters and defaces the biophysical environment, pollutes the ground water, causes ecological imbalance, destroys the built environment, causes loss of environmental resource and so on. This also applied to the biophysical environment of secondary schools in Gwagwalada Area Council, Abuja.

The statement of the problem therefore is the assessment of the effects of the solid waste disposal on the biophysical environment of secondary schools in Gwagwalada Area Council, Abuja. The students in Gwagwalada Area Council are not aware of waste-health disposal and management linkages; the management of Gwagwalada Area Council is not discharging her environmental responsibilities effectively; and the waste management practice in the area council is not environmentally friendly. As efforts to intensify environmental education in schools through multidisciplinary approach have continued to increase over the years, a varied feedback has been received regarding students' level of awareness, attitudes and participation in environmental activities.

Objectives of the Study

This study is based on the following objectives;
1. To assess the current wastes disposal methods of secondary schools in Gwagwalada Area Council.
2. To examine the preferred method for waste disposal of secondary schools in Gwagwalada Area Council.
3. To examine the common environmental problems on school compound of secondary schools in Gwagwalada Area Council.
4. To determine the level of students' attitudes to waste management of secondary schools in Gwagwalada Area Council.
5. To Show the waste management practices of secondary schools in Gwagwalada Area Council.

Research Questions

To achieve the above objectives, the study raises the following research questions:
1. What are the current wastes disposal methods of secondary schools in Gwagwalada Area Council?
2. What are the preferred methods for waste disposal of secondary schools in Gwagwalada Area Council?
3. What are the common environmental problems on school compound of Secondary Schools in Gwagwalada Area Council?
4. What is the level of students' attitudes to waste management of secondary Schools in Gwagwalada Area Council?
5. What are the waste management practices of secondary schools in Gwagwalada
6. Area Council?

Research Hypotheses

a) There is no significant differences in the level of the current wastes disposal methods of secondary schools in Gwagwalada Area Council.
b) There is no significant difference in the preferred method for waste disposal of secondary schools in Gwagwalada Area Council
c) There is no significant difference in the common environmental problems on school compound of secondary schools in Gwagwalada Area Council.
d) There is no significant difference in the level of students' attitudes to waste management of secondary schools in Gwagwalada Area Council.

e) There is no significant difference in the waste management practices of secondary schools in Gwagwalada Area Council.

Materials and Methods

A cross-sectional study design was used to assess the knowledge, attitude and practice of waste management among secondary school students' in Gwagwalada Area Council, Abuja.

The population of the study consists of the following selected secondary schools in Gwagwalada Area Council, Abuja.
1. Government Day Senior Secondary School Gwagwalada
2. Hajj Camp Senior Secondary School Gwagwalada
3. Pilot Junior and Senior Secondary School Gwagwalada
4. Government Secondary School Gwagwalada
5. Abuja Capital International Secondary School Gwagwalada
6. Great Success International Secondary School Gwagwalada
7. Standard Comprehensive Secondary School Gwagwalada
8. Anne Basic Academy Secondary School Gwagwalada

Validity

Validity refers to the extent to which an instrument measures what it was supposed to measure. The instrument was evaluated for content validity. This is the extent to which a questionnaire is representative of the respondents should have covered in their course of study. The questionnaire was read and examined to evaluate the clarity of items taking into consideration from three Kenya Curriculum syllabuses, vocabulary and sentence structure.

Reliability

Reliability is a measure of degree to which research instrument yields consistent results or data after repeated trials. It is verified by the consistency of the observation of an outcome. To test the reliability, the study used test-retest technique which involved administering the same instrument twice to identical respondent not included in the study sample. This was done during the validity test.

Data analysis

The statistical methods used in this study were descriptive statistics of frequency, percentage, mean and standard deviation. Inferential statistics of Chi-square, polynomial and Spearman's rank correlation was used to estimate relationship between the students' socio - demographic characteristics and their knowledge, attitude and practices on waste management. Likert scale was used to measure the strength of the students' knowledge, attitude and practices on waste management by assigning nominal values to items according to scales. Questions on knowledge were assigned a score of 1- 4 for 'very often', 'often', 'sometimes' and 'not often' respectively. Questions on attitude were scored based on negative or positive wording of the items. For every positively worded item, a score of 0 - 3 was assigned. The scoring pattern was reversed for the negatively worded items. Questions on practices were assigned a score 0 - 2 for 'not sure', 'no' and 'yes' respectively.

In order to statistically determine the levels of knowledge, attitude and practice, the scores for each dimension was partitioned. The mean value added to one standard deviation represented the upper limit while the mean value minus one standard deviation represented the lower limit. The mean values above the upper limit.

Result of the Findings

Demographic characteristics of the respondents

The result analyzed shows that respondents used for this study possess the following demographic characteristics; the total number of respondents is three hundred and fifty eight (n=358). The males are 55% and females are 45%, 22.7% are junior secondary students (JSS) while 77.3% are senior secondary students (SSS). Their age ranges are 14.9% for age 10-l2yrs, 56.5% for 13-15yrs and 28.6% for 16-l9yrs. 70.6% of the respondents are Christians, 29.1% are Muslims while 0.3% is other types of religion. 84.8% are Yoruba, 11% Igbo and 4.2% are other tribes. On the types of waste generated in their schools, the study revealed that a large percentage (92.1%) is organic, consisting of paper, leaves, wood and other biodegradables while the others are inorganic. Paper and paper products represent a huge component of solid waste due to the predominance of academic activities.

Research Question One: Current Waste Disposal Methods in Senior Secondary Schools in Gwagwalada Area Council FCT- Abuja

Table 1. Current waste disposal methods in schools

Methods	Frequency	%
Open burning	272	76.0
Composting	15	4.2
Recycling	15	4.2
Landfill site	26	7.2
Don't know	30	8.4
Total	358	100

The data in Table 1 shows that open burning (76%) is the commonest method in use for disposing wastes in Secondary Schools in Gwagwalada Area Council FCT-Abuja. A few (7.2%) claimed to use landfill site, while 4.2% each identified composting and recycling respectively. It should be noted that what is referred to as landfill site in most schools is an open dump site, composting and recycling are not being practiced as claimed by the students.

Research Question Two: Preferred methods for waste disposal in senior secondary schools in Gwagwalada Area Council FCT-Abuja

Table 2. Preferred methods for waste disposal

Methods	Frequency	%
Which of these methods of disposal would You like to put into use in your school		
Landfill site	19	5.3
Open burning	64	17.8
Recycling	118	33.1
Open dumping	28	7.8
Incinerating	129	36.0
Total	**358**	**100**

When asked if they carry out any environmental sanitation work in their schools, majority, i.e. (92.1%) of the students said yes responses. Although, 6.2% said – No, while 1.7% gave - Don't know responses. On the opportunity to reuse or recycle their waste within the school environment, 63.4% of the students gave negative responses, 27.4% said - Yes while 9.2% gave - Don't know responses. Whether wastes can be converted to wealth, most of the respondents (66.1%) gave positive responses, 20.1% said - No while 13.8% gave - Don't know responses. It is amazing to note that majority of the respondents preferred incinerating (36%) and recycling (33.1%) as viable methods of waste disposal, although the respondents are aware of these alternative environmental friendly methods but they are not being practiced in their schools.

Table 3: Shows the burning of waste openly and indiscriminate littering

	Not often	Sometimes	Often	Very often	Mean	SD	Rank
Indiscriminate Littering	103 (29.3)*	113 (37.9)	70 (19.9)	45 (12.8)	2.16	0.99	2
Unkempt grass and Hedge	185 (53.0)	97 (27.8)	45 (12.9)	22 (6.3)	1.72	0.92	5
Burning of waste openly	113 (32.9)	95 (27.7)	96 (28.0)	39 (11.4)	2.18	1.02	1
Solid waste	157 (45.6)	107 (31.1)	64 (18.6)	16 (4.7)	1.82	0.89	4
Public urination	176 (51.3)	54 (15.7)	55 (16.9)	55 (16.0)	1.98	1.15	3
Worn-out posters	208 (60.6)	88 (25.7)	32 (9.3)	15 (4.4)	1.57	0.83	7
Damaged water pipes	203 (58.3)	60 (17.2)	67 (19.3)	18 (5.2)	1.71	0.95	6

* Values on parenthesis are the percentages.

Table 3 shows that burning of waste openly and indiscriminate littering are the prevailing environmental problems found on school compounds across the study areas and by extension Abuja Municipal Area Council. Others are public urination, disposal of solid waste while burst water pipes and worn out posters were the least. When their responses were pooled and scored, it was discovered that (19.4%) of the respondents could be classified as possessing low knowledge of environmental education while (63.4%) respondents were having average level of knowledge regarding waste management.

Research Question Four: The Level of Students' Attitudes to Waste Management in Senior Secondary Schools in Gwagwalada Area Council FCT-Abuja.

Table 4. Level of students' attitudes to waste management

	Not sure	Not Worried	Worried	Very worried	Mean	SD
To what extent do you worry about waste around your school premises	30 (8.5)*	79 (22.4)	127 (36.0)	117 (33.1)	2.94	0.95
	Not sure	Not comfortable	Comfortable	Very comfortable		
How comfortable are you having waste around your school premises	16 (4.5)	258 (72.9)	39 (11.0)	41 (11.6)	2.30	0.73
	Not sure	Not satisfied	Satisfied	Very satisfied		
Are you satisfied with the way students disposes their wastes		250 (70.8)	48 (13.6)	33 (9.3)	2.26	0.71
Are satisfied with the way the waste are handle by your school management	22 (6.2)					

*Values on parenthesis are the percentages.

Using the percentage to analyze the students' responses itemized in Table 4, only 22.4% of the students were not worried about the waste around their school premises, 36.0% and 33.l% gave worried and very worried responses respectively. At least, 72.9% of students were not comfortable, 11.0% are comfortable and 11.6% were very comfortable having waste around their school premises. Whether being satisfied with the way students dispose their waste, 70.8% were not satisfied, 13.6% were satisfied and 9.3% were very satisfied. On the issue of satisfaction with the way the waste was being handled by their school management, 30.1% were not satisfied, 34.4% were satisfied and 28.2% were very satisfied. When their responses were being scored, it was discovered that (52.4%) of the students had moderate attitude towards waste management and only (19.7%) were found to have less favorable attitude.

Research Question Five: the waste management practices in senior secondary schools in Gwagwalada Area Council FCT-Abuja.

Table 5. Showed the waste management practices in their schools.

	Questions for Respondents	Yes	No	Not sure	Mean	SD
1	Change your ways in order to reduce the amount of waste generated in school	250 (75.1)	46 (13.8)	37 (11.1)	1.97	0.50
2	Participate in waste management activities in your school	250 (70.6)	84 (23.7)	(5.6)	1.82	0.51
3	Support the development of environmental policy for your school	272 (77.9)	49 (14.0)	28 (8.0)	1.94	0.47
4	Decide to re-use or recycle the waste rather than throw it away	158 (44.9)	146 (41.5)	48 (13.6)	1.72	0.69
5	Attended any training, seminar workshop on waste management	141 (40.2)	166 (47.3)	44 (12.5)	1. 65	0.69
6	Attend a youth environmental scout club in your school	229 (65.2)	103 (29.3)	19 (5.4)	1.76	0.54
7	Participate in a weekly sanitation Programme	227 (65.6)	89 (25.7)	30 (8.7)	1.83	0.56
8	Contribute to an organization that works to protect the environment	217 (62.9)	87 (25.2)	41(11.9)	1.87	0.60
9	Reduced water consumption for environmental reasons	122 (35.4)	156 (45.2)	67 (19.4)	1.74	0.76
10	Discourage burning of refuse	184 (53.6)	124 (36.2)	35 (10.2)	1.74	0.63
11	Cleared a refuse site around your school premises.	268 (78.1)	40 (11.7)	35 (10.2)	1.99	0.47

*Values on parenthesis are the percentages.

Table 5 revealed that the respondents' practices about waste management in their respective schools are positive except in item 5 and 9. Responses to item 2 and 4 show that 70.6% of the respondents used to participate in waste management activities in their schools, while act on reuse or recycle of waste rather than throw it away did not show much differences. Respondent responses to item 6 and 7 reveal that 65.2% attended a youth environmental scout club in their schools while 65.6% did participate in a weekly sanitation programme in their school premises. Item 10 and 11, show that 53.6% of the respondents act to discourage burning of refuse in the school premises and majority of them (78.1%) cleared a refuse site around their school compound. This is the true picture of what goes on in the Nigerian schools. It is the students that do the weeding of grasses on playgrounds (a day in a week is designated labour period) as well as clear and burn refuse on/around their schools. When their responses were scored, those who had good practices were assumed to be managing the waste in proper

manner and be able to protect the members of the school community from the negative impacts of the waste. It was found that only 18.3% of the respondents could be classified as having good practices, while more than half (67.9) of the respondents had moderate practices and the rest were found to have poor practices towards waste management.

Test of Hypothesis
Table 6: Test of significant relationship between students' knowledge, attitude and practice of waste management.

Variables		Knowledge			X^2
		Low	Average	High	
Sex	Male	18 (9.3%)	126 (64.9%)	50 (25.8%)	2.818
Class	Female	22 (13.8%)	105 (66.0%)	32 (20.1%)	
Age	JSS	9 (11.5%)	61 (78.2%)	8 (10.3%)	8.796*
	SSS	30 (11.3%)	167 (62.8%)	69 (25.9%)	
Sex	10-12	12 (24.0%)	35 (70.0%)	3 (6.0%)	
Class	13-15	18 (9.5%)	131 (68.9%)	41 (21.6%)	22.951**
Age	15-19	8 (8.3%)	54 (56.2%)	34 (35.4%)	
		Attitude less favourable	Favourable	Most favourable	X^2
Sex	Male		117 (60.3%)	44 (22.7%)	10.781**
	Female	33 (17.0%)	68 (42.8%)	52 (32.7%)	
Class	JSS	39 (24.5%)	42 (53.8%)	23 (29.5%)	0.647
	SS	13 (16.7%)	139 (52.3%)	72 (27.1%)	
Age	10- 12	55 (20.7%)	27 (54.0%)	10 (20.0%)	
	13-15	13 (26.0%)	105 (55.3%)	50 (26.3%)	3.732
	15-19	35 (18.4%)	46 (47.9%)	31 (32.3%)	
		19 (19.8%)			X^2
		Practice Poor Practice			
Sex	Male				
	Female	16 (8.2%)	151 (77.8%)	27 (13.9%)	6.195*
Class	JSS	9 (5.7%)	112 (70.4%)	38 (23.9%)	
Age	SS	11 (14.1%)	58 (74.4%)	9 (11.5%)	
	10- 12	15 (5.6%)	198 (74.4%)	53 (19.9%)	
	13-15	9 (18.0%)	33 (66.0%)	8 (16.0%)	
	15-19	13 (6.8%)	145 (76.3%)	32 (16.8%)	14.244**
		2 (2.1%)	71 (74.0%)	23 (24.0%)	

Chi-square analysis was done to test the significant difference in student awareness and practices of waste management by their back Analysis in **Table 6** suggests that no significant differences between them in knowledge score but female students had significantly higher attitude than the male. Female students could be said to have positive w. attitude and practices than their male counterpart. This considers the fact that in most households and schools in developing countries do most of the cleaning and sweeping activities. There are signs observed in students' knowledge and practices according to classes of students, there is no significant difference in their attitude. With respect to a significantly in knowledge and practices only.

In order to establish the demographic correlates of the waste management variables of students, some demographic characteristics of the students presumed to possibly have a measure of influence on the awareness, knowledge and practices of waste management, using Pearson correlation (r).

Table 7. Correlation of demographic characteristics of Respondents

Table 7. Correlate between students' background variables and	Sex	Age	Class	Knowledge	X^2
Sex	1				
Age	-0.102	1			
Class	-0.022	0.472	1	1	
Knowledge	-0.088	0.237	0.117		
Attitude	0.018	0.079	-0.039	0.176	
Practice	0.127	0.155	0.143	0.122	

** Correction is significant at the 0.01 level (2-tailed). *Correction is significant at the 0.05 level (2-tailed).

In Table 7, there is a negative Relationship between sex and student's knowledge about waste management while positive relationships exist between their age, class and knowledge. There is a positive relationship between age and knowledge, attitude and practice but negative relationship exist between class of study and attitude about waste management. The level of knowledge of students translated to their positive practice of waste management.

Discussion of Findings

The findings of the study have made it clear that waste management is a serious environmental problem of secondary schools in Gwagwalada Area Council FCT-Abuja, and students are aware of it. The results are supported by Chanda (1999) report that people's environmental knowledge was highly specific to issue and geographic scale. This study confirmed Raudsepp's work in 2001, who found that women were significantly more likely than men to be concerned with environmental problems. Females have been consistently shown to have higher environment conscious attitudes than men. The common reason advanced for gender differences is the different socialization patterns between boys and girls (Raudsepp, 2001; Diamantopoulos, Schlegelmilch, Sinkovics and Bohlefl, 2003). More often than not, girls are made to carry out most of all the sweeping and cleaning activities; they are called upon more than their male counterparts to perform maintenance tasks at home or in schools.

Also, Duan and Fortner (2005) found that students possessed high environmental awareness and knowledge of local environmental issues than global environmental issues. The

positive attitude and practice of female towards waste management confirmed the findings of Pacey (1990) that formal education for women in particular is a prerequisite for change in sanitation behaviour. The findings indicate that most respondents understand waste management as a major environmental problem in their schools. Findings also indicated that the propensity for waste management practices to differ by sex, class and age of students. Significant relationships were observed between students' sex, age and class and their level of attitude, knowledge and practices of waste management.

The findings from this study have great implications for waste management practices in schools and the need to increase students' knowledge, attitude and practice of waste management issues. The study also revealed the need for behavioral and attitudinal change which is essential effective participation in waste reduction, reuse and recycling. These findings found enormous support with previous studies (Jones and Dunlap, 1992; Scott and Willet, 1994; McKenzie-Mohr et at., 1995; Bradley et al., 1999; Fransson and Garling, 1999; Eero *et al*, 2001), who has documented some relationship between some socio-demographic variables such as sex, age, and education and environmental behaviour/practices. The problem of solid waste management and people's attitude and perceptions in the society can be linked to the levels of formal education. Improved teaching and learning of issues on sanitation in all levels of education could help improve the general sanitation in the schools and communities by extension.

This supports the suggestion of Agbola (1993) that perceptions and attitudes are learned response sets and can therefore be modified or changed through education. Hence, seminars, talk show and continuous public education on sanitation could be organized by the government or school management for students, teachers and administrators to sensitize and educate them to waste problems and their consequences on the students. When stakeholders are made aware of their environment unfriendly practices behaviour and provided with strategies to address them, they are better able to promote environment friendly practices. It is expected that waste management activities in schools involve the students as part of their learning process. The particular skills and knowledge gained from environment education would help in changing human behaviour towards the environment. Students with some knowledge and skills on environmental education are more motivated to take part in environmental protection activities and plans, thus would generate new ideas for the solution of environmental problems. Sharing new information from their activities with families, other adults, and community probably will have some positive implications on solid waste management practices.

Students' awareness about environmental problems and solutions can be increased through education. The introduction or integration of waste management concepts and themes through environmental education and school curriculum at all levels will not only improve students' understanding of waste management but more likely to change their seemingly unfriendly waste management attitude and practices. We must note that the Nigerian curricula need adjustments to allow for the inclusion of standard environmental education and training at both formal and informal levels. In so doing, the residents would prospectively thwart the on-going environmental damage which is a threat to human survival and sustenance both now and in the future due to the lack of proper management of solid waste.

Environmental education in the school sector should provide opportunities for students and teachers to engage in actions and behaviour that impact positively towards achieving a more

sustainable school environment. Another aspect that is important to pay special attention to because of its practical sequels on environmental education is teacher training sensitive about environmental makers.

For example, where the environmental education nowadays is included in some way in most of the basic education curricula, but teachers are not qualified to teach it. The teacher's interest in environmental issues seems to affect children's learning processes. Private waste collection organisation should be employed to cart away waste from the School Company after the biodegradables ones might be composted and non-degradable ones recycled.

Summary

Waste is directly linked to human development, both technologically and socially. Waste disposal and management is the human control of the collection, treatment and disposal of different wastes. This is in order to reduce the negative impacts waste has on environment and society. This chapter therefore present a summary of the research study, on which conclusion are drawn and recommendations put forward for possible ways of mitigating the unpleasant effect of waste disposal on the biophysical environment of secondary school in Gwagwalada area council of the federal capital territory, Abuja-Nigeria.

This research study, An Assessment of the effects of solid waste disposal on the biophysical environment of secondary school in Gwagwalada area council of the federal capital territory, Abuja - Nigeria, examined, among other things, the level of awareness on health-waste disposal and management linkages, student attitude and behavior in disposing waste, environmental institutional arrangement and waste disposal and management in the area council.

For the objectives of the research study to be accomplished, three hypothetical assumptions were formulated: Student in GAC are significantly aware of the health-waste disposal linkages.

ii. The management of GAC is discharging it environmental responsibilities effectively, and the waste management practice in GAC is environmentally friendly. The research instrument for this study was questionnaire, which was constructed in a likert-scale format. It was distributed and retrieved within a week. Data collected was analyzed using the simple and parametric statistics. The result of the research finding shows that there is no health- waste disposal and management linkages awareness in the area council, majority of the inhabitants are not environmentally conscious, they disposed waste indiscriminately. Also there is no environmental institution arrangement in GAC. The management of the area council is less concern of the impacts of wastes on the biophysical environment. Additionally, the waste disposal and management practice (open dump) in the area council is out-dated.

Conclusion

Though the level of knowledge, attitude and practice of waste management was relatively moderate in secondary schools in Abuja, the percentage of those who used indiscriminate solid waste disposal methods like open dumping and open burning was higher. Educational status, age and gender, among others, were factors influencing solid waste management in secondary schools in Abuja. The knowledge of the current status of waste disposal options and level of awareness of

solid waste management will help the government and sectors involved to take action to establish sound environmental education and awareness on waste management. Nigeria has a long way to go in the area of environmental education and awareness for the citizens to put off the tong-acquired habit of indiscriminate waste disposal. There is the need to enlighten the students and the populace by extension on the wealth inherent in their organic, plastic and paper wastes. Solid waste management policies and enforcement of sanitation laws in various Nigerian schools should be energized, and various environmental organizations and societies to do more until the dreamed clean environment in Nigeria becomes a reality.

Recommendations

The objectives of environmental education demand more challenging learning outcomes. This should ensure that students are not only aware but they develop the right attitude towards the environment. The classroom practices therefore need to improve awareness about environmental concerns, develop understanding of ecological principles, arouse concern for environmental problems, stimulate commitment for environmental protection and demand action to promote conservation of natural resources. Need for use of more innovative and proper methods and techniques is heightened by the fact that what is being learnt goes much beyond the learning of traditional subjects and the teacher has to clarify values and ensure participation and actions on the part of the learners. This study found out that students in Gwagwalada Area Council FCT-Abuja do not understand well the relationships of cause and effect as well as the human impacts in an environmental system. It was also found out that though the students had a positive attitude towards conservation the majority had a negative attitude towards taking responsibility in ensuring that the environment is conserved. In this regard, it is recommended that all teachers handling environmental education content use methodologies that can help students in all the three domains of learning i.e. cognitive, affective and psychomotor.

It is also recommended that teachers use more active teaching approaches including trips, projects, community service and academic excursions. This will expose students to the reality of environment and environmental problems hence enhancing holistic learning.

1. Factors that affect students' level of environmental awareness, attitude and participation in environmental activities.
2. A survey of the teaching methodologies used in secondary schools and how effective they are in achieving Environmental Education goals.
3. The relationship between Environmental Education and the level of environmental awareness, attitudes and participation in environmental activities among students.

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