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Beverage Container Recycling for Schools: A Grassroots Response to the extended Producers Responsibility and Consumer Products Stewardship Programme

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Abstract

Waste generators, both producers and consumers can play vital roles in contributing to resource conservation and preventing potential environmental health problems by proper disposal of end-of-life products such as beverage containers. Indiscriminate disposal of beverage packages exacerbates the problem of clogged drainages leading to flooding and contributing to climate change. To overcome this problem, an incentive based awareness programme was explored, in the context of the manufacturers' Extended Products Stewardship Programme. The awareness of stakeholders, especially teachers and students in six purposively selected public schools in Ibadan, was first actively raised, before the schools were challenged with recycling of pure water sachets (PWS) and Polyethylene terephthalate- (PET) bottles. Trained volunteers were assigned to each school to anchored environmental awareness talks for four consecutive weeks. A Travelon scale was used to weigh accrued waste before evacuation to Aleshinloye recycling facility, Ibadan. Data was entered into an excel spread sheet and analyzed with descriptive statistics. A total of 7,062 students participated in the program. A total of 499 kg and 465 kg PWS and PET waste were accrued in the primary and secondary schools respectively. In all, 76 creative products entered the creative challenge. Active participation in sorting and innovative reuse of PWS and PET was seen across schools and reinforced. There is a need to scale up incentive based program on beverage recycling as a means of promoting environmental sustainability.

Keywords:
Beverage containers;
Creative challenge;
Creative products;
Extended Products Stewardship Programme

Introduction

Across the regions of the world, end of life take-back regulations are being enacted and enforced. Waste generators, both producers and consumers play vital role in contributing to resource conservation and preventing potential environmental, health and safety problems by properly disposing of end of life products such as used beverage containers and pure water sachets. The Extended Producers Responsibility and Consumer Products Stewardship Programmes were mandated by the National Environmental Standards and Regulations

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Enforcement Agency (NESREA) and the Federal Ministry of Environment for all manufacturers and importers of various products. This was done to establish a Buy-Back programme for bottles and other packaging.

Pure water sachets and PET-bottles are the prevalent and cheapest forms of packaging for the most consumed beverages in Nigeria. The resultant waste from consumption pure water sachets and PET- bottles clog drainages (exacerbating flooding), pollute water bodies, litter the environment and release noxious gases to health and environment when burnt at dumpsites. Successful recovery and recycling programs have been initiated in parts of Nigeria. For example in Oyo state, the Nigerian Network For Awareness and Action For Environmental Health (NINAAFEH)/MTN project at Aleshinloye market is an example of a waste to wealth program utilizing waste generated from the market. In Lagos, WeCyclers partnering with Lagos State Waste Management Authority recently completed a successful resource recovery and collection pilot program in Itire, Lagos, engaging and rewarding residence for collecting recyclable materials in the area. These opportunities are enormous in changing the landscape of how we view and address the issues of waste. As a result, this pilot project was designed as educative and rewarding recycling program in selected public primary and secondary schools in Ibadan, Nigeria.

Sustainability is the conscious and proactive use of methods that do not harm people, planet or profit while also leaving a positive impact (Wandiga, 2013) and this is critical in waste management in order to curb environmental issues that are associated with indiscriminate waste disposal. Recycling delivers a wide array of benefits to the environment such as conservation of natural resources, reduction in the amount of material that would otherwise be landfilled or littered, energy saving and reduction of greenhouse gas (GHG) emissions and air pollution.

Beverage container recycling reduces GHG emissions in two ways: firstly, from the lower energy requirements needed to manufacture products from scrap material versus using ore and other raw materials; secondly, from the avoidance of non-energy related GHG emissions occurring during the transformation of raw materials to market-ready feedstock. An example of non-energy related GHG emissions is the emission of methane (CH4) during the production of plastic resins or the conversion of limestone to lime that occurs during the production of aluminum. Each beverage container material type has unique processes and energy requirements for manufacturing and recycling California Department of Conservation (2008). The proportion of energy saved from beverage container recycling by material type, as opposed to disposal and restarting the product lifecycle from virgin material, is listed in Table 1 below.

Table 1: The Energy Savings from Recycling of Different Materials

Material type	Proportion energy saved by recycling
Aluminium	95%
Glass	30%
Plastics (all resin types)	70%

Source: California Department of Conservation (2008)

Polyethylene terephthalate (PET) is a thermoplastic polymer resin of the polyester family used in synthetic fiber, beverage, food and other liquid containers, thermo-transforming applications and engineering resins often in combination with glass. PET is a highly valued packaging material because it is strong yet lightweight, non-reactive, economical, shatterproof - preserving content from manufacturing to consumption - and recyclable. PET containers are popular for packaging soft-drinks, juices, cooking oil, pharmaceuticals, and water. PET has been thoroughly reviewed and approved as safe for contact with foods and drinks by the USFDA, Health Canada and the European Food Safety Authority. The National Agency for Food and Drug Administration and Control (NAFDAC) at present are not specific on packaging, but the agency is in the process of developing regulations on packaging (Alcohol and Tobacco Tax and Trade Bureau, 2012). An inquiry made to the library of Standards Organization of Nigeria (SON), reveal similar finding – stating that standards for packaging of beverages are currently being developed.

In Nigeria, PET is used in all bottled table water packaging and some the carbonated drinks, making it the most widely-used and fastest-growing polymer for plastic bottles and jars. It is steadily increasing market share by replacing other pack types, especially in expanding beverage global markets (Smye

Holland Associates, 2013). However, the level of collection and recycling, and the relevant recycling infrastructure available, varies considerably between countries and regions. Therefore society has an important role to play in terms of raising awareness among individuals role in collecting PET for recycling.

Nigerian Bureau of Statistics (2012) reported that only 8.1% of households in Nigeria had access to treated pipe borne water. In Oyo state 42.1% of households depend on protected well/springs for water supply. Responsibility for water supply is shared between three levels of government – federal, state and local. The federal government is in charge of water resources management; state governments have the primary responsibility for urban water supply; and local governments together with communities are responsible for rural water supply. Failure of government in providing pipe borne water to Nigerians has been perceived as being responsible for the emergence of pure water in poly-sachets. Nigeria is the most densely inhabited country in Africa with a population of 158 million people (and growing rapidly) – 63.2 million people in Nigeria don't have access to safe water (Wateraid, 2013).

Pure water in sachets is the most consumed drinking water package in Nigeria. NAFDAC stated that over 4 million pure water companies are registered yearly with reported daily sales of fl 7 billion (Utip 2013). The high business turn-over results from the affordability of drinking water packaged in sachets. Contrariwise, nylon package are non-biodegradable; they collect around the city, choking drainages, and water ways. Also, accumulation of plastic packages in dumpsite causes land degradation and emission of greenhouse gases when fire is set on them (Idiata 2012). One of the main problems facing Ibadan, which has become an intractable nuisance, is open and indiscriminate dumping of biodegradable and non-biodegradable waste (Ishaq 2004).

Substantial evidence around the world supports resource cycling as it reduces reliance on landfills/dumpsites and incinerators; protects the health and environment; and conserves natural resources by reducing the need for raw materials (USEPA, 2012). One of PET's most outstanding qualities is its exceptional recyclability. Approximately 1.5 billion pounds of used PET bottles and containers are recovered in the U.S. each year for recycling, making it the most recycled plastic in America (PETRA, 2012). PET can be recovered and recycled again and again by thorough washing and re-melting for use in new PET products, or by chemically breaking down the PET into its constituent raw materials, which are then purified and converted into new PET. Any PET that is unsuitable for recycling because it is too dirty or contaminated to be properly cleaned can be safely and efficiently burned as an energy source in a process called "thermal recycling" (PETRA, 2012). In providing a sustainable solution to empty pure water sachets in Nigeria Richbol Environmental Services (2010) made a strong advocacy stating that “the sachets recycling technology being advocated is capable of providing between 9,000 and 15,000 job opportunities in each of the states in Nigeria, depending on the size, population density and level of industrialization of each state. (This means that the technology is capable of providing over 370,000 direct job opportunities in the entire country, aside several other thousands of indirect jobs it will create).” Empty pure water sachets can be recycled into pellets for making nylon bags of different shapes and sizes, pipes, and used as resins for other plastic products.

The concept of waste recycling is not new in Nigeria, and some public-private partnerships have reported success. In order to increase consumers' plastic recycling, Davis et al., 2006, alluded that environmental attitudes and awareness must be considered. In an assessment of Six-Month Report of Beverage Container Recycling and Significant Carbon Reductions in California, USA, improved economics of recycling and increased public awareness of the beverage container recycling program were reported as contributing factors that delivered positive benefits to California's environment. In Canada, the Canadian Beverage Container Recycling Association Program Plan was formed after the government set a must achieve 75% diversion target for recycling in the beverage sector. In consonance with this a beverage container recycling awareness campaign was designed to increase awareness of

away-from-home recycling options and change consumer behavior in order to attain a recovery target.

Currently, there is paucity of information on the level of awareness of Nigerians on waste recycling, and grassroots initiatives to recycle waste materials are far and in-between. In Lagos Alkem Nigeria Limited (a buy-back and recycling scheme for used PET bottles) jointly sponsored by the Nigerian Bottling Company Plc and Wecyclers (a buy-back and recycling scheme with the Lagos State Waste Management Authority) are among grassroots success stories on waste recycling.

Methodology

Eight primary schools and nine secondary schools in Ibadan were selected for the pilot project for building awareness on collecting and recycling end-of-life products. See Table 2 for details.

The schools were selected based on the following criteria.

- Better management and nearness to the coordinating organizations (NEST /GCC)
- Ease of evacuation by Oyo State Waste Management Agency (OYOWMA)
- Easy anchoring by the volunteers who gave weekly environmental talks in schools.

A preliminary assessment of the waste management practices and sanitation facilities present in the school was carried out in the selected schools. The assessment documented the method of waste collection, sorting and disposal; condition of sanitary facilities present, source of water supply and hand washing facilities in the schools. A stakeholders meeting followed by a sensitization workshop was organized for all stake holders involved in the project. Stakeholders included: *Nigerian Environmental Study Action Team (NEST), *Greennovative Chain Consulting (GCC) Manufacturers Association of Nigeria (MAN), University of Ibadan Center for Sustainable Development (CESDEV), National Environmental Standards and Regulation Enforcement Agency NESREA, Ministry of Environment, Department of Environmental Health Sciences, University of Ibadan, Oyo State Solid Waste Management Authority (OYOWMA), Nigerian Network For Awareness and Action For Environmental Health (NINAAFEH), Ministry of Information, SUBEB, Ministry of Education and Representatives from Target Schools.

Responsibilities were assigned to different stakeholders using a RACI chart shown in Table 3. The RACI Matrix is a powerful tool to assist in the identification of roles and assigning of cross-functional responsibilities to a project deliverable or activity.

RACI definition

- ***R***esponsibility = person or role responsible for ensuring that the item is completed
- ***A***ccountable = person or role responsible for actually doing or completing the item
- ***C***onsulted = person or role whose subject matter expertise is required in order to complete the item
- ***I***nformed = person or role that needs to be kept informed of the status of item completion.

Table 2: Selected Primary and Secondary Schools for the Project

Primary schools	Secondary schools
Anwar-ul-Islam Primary School I	Anwar-ul-Islam Junior Secondary School I
Anwar-ul-Islam Primary School II	Anwar-ul-Islam Junior Secondary School II
Anwar-ul-Islam Primary School III	Methodist Junior Grammar School
Abadina Primary School I	Methodist Senior Grammar School
Abadina Primary School II	Immanuel College Senior School 1
Abadina Primary School III	Immanuel College Junior School 1
Methodist Primary School I	Immanuel College Senior School 2
Methodist Primary School II	Immanuel Grammar School
	Anwar-ul-Islam Senior Secondary Schools

Table 3: RACI Chart of Project Stakeholders

Role / Project Deliverable (or Activity)	NESREA	Min. of Environment & Habitat	OYOWMA	NINAAFEH	MAN	CESDEV - UI	Min. of Education	NEST	GCC	Dept. of Env. Health Sciences - UI	Min. of Information & Orient.	Target Schools
Stakeholder Consultation *(Ministry of Environment (OYOWMA), Ministry of Education (SUBEB, TESCOM), Ministry of Information & Orientation (Press, Media), Ministry of Science, Technology & Industry*)	C	R	C	C	I	I	R	A	A	C		I
Assist with content development for environmental talks in schools / recycling booklets	C	I	I	C	I	C	C	A	A	R		I
Host the kick – off sensitization workshop for School Authorities	C	R	C	C	R / A	C	C	A	A	C		I
Sensitization of the Schools for the Project / Identification of change agents in the schools	R	I	I	R	I	I	R	A	A	R		R / A
Identification / Recruitment / Provision of volunteers to give enviromental talks in schools	R	I	I	C	I	I	R	A	A	R		I
Provide recycling receptacles and trash bags for the pilot programme in 6 schools	I	I	R	I	I	I	I	A	A	R		A
Provide trash pick –up (collection) services from the pilot schools to the designated materials recycling facility / facilities	I	I	R	I	I	I	I	A	A	I		A
Fund the reproduction of educational recycling booklets and posters for the pilot schools	C	R	C	C	R	C	I	A	A	C		I
Providing weigh scales for the pilot schools (Hanging scale 100kg capacity min 5kg intervals)	I	I	R	C	I	I	I	A	A	C		I
Provide bus transportation for the organized school field trip to the designated recycling facility e.g. MTN Aleshinloye Materials Recycling and Composting facility	I	I	C	C	R	I	R	A	A	I		I
Donate awards (cash/kind) to winners of the School Recycle and Up-Cycle Enterprise challenge	R	I	I	I	R	I	I	A	A	I		I

The program was formally kicked-off in targeted schools on 19th June, 2013 by trained project volunteers from NEST, GCC and NESREA. The volunteers coordinated awareness talk in the schools during the assembly period for 10 minutes once a week. The volunteers used an environmental awareness training guide developed by stakeholders. Empty PWS and PET bottles were collected by students and disposed into trash bags previously provided. Filled trash bags were labeled, tied and dropped in collapsible cuboid receptacles provided to the schools by OYOWMA. A travelon weighing scale was used to weigh trash bags before they were transported by OYOWMA to Aleshinloye Market Solid Waste Recycling Facility.

Students were also challenged to develop innovative and creative products with empty PWS and PET bottles. A 5-point scale, considering originality, creativity, marketability, appearance and technical quality was used to assess the products. Incentives were given to target schools based on their level of participation in the waste collection (total weight of pure water sachets and PET accrued) and the creative reuse challenge. The data was entered into an excel spread sheet and analyzed with descriptive statistics.

Results and Discussion

Results of the preliminary assessment carried out in the schools revealed that waste management involved collection of waste into classroom waste baskets and disposing contents in designated dumpsite areas behind the schools. The waste at the various dumpsites was typically set on fire at regular intervals and no form of waste sorting or segregation took place during collection and disposal as well.

All (7,062) student in 17 sub-schools participated in the environmental awareness program. The awareness talk spanned over four weeks. Students collected empty PWS and PET into trash bags, tied and label them before placing them in the receptacle provided. The total weight of waste accrued for the duration of the project was 499kg in the primary and 465kg in the secondary schools respectively. Prior to the official kickoff of the programme in the schools, three schools stood out for their eagerness and enthusiasm in embracing the beverage recycling initiatives. These – early starters - began collection of PWS and PET immediately after the stakeholders' sensitization workshop. The total amount of PWS and PET accrued by the early starters were 126kg (Table 4).

Table 4: Waste Accrued in Target Primary Schools

School name	Total no. of students	Waste generated (kg)	Waste generated (kg/person)
*Anwar-ul-Islam Primary School III	352	148	0.42
Anwar-ul-Islam Primary School I	340	55	0.16
Methodist Primary School I	245	46	0.19
Abadina Primary School III	205	36	0.18
*Anwar-ul-Islam Primary School II	399	32.5	0.08
Methodist Primary School II	320	28	0.09
Abadina Primary School I	220	17	0.08
Abadina Primary School II	238	10.5	0.04
Total	2,319	373	Mean=0.16±0.059

*****_Early starter_

Table 5: Waste Accrued in Target Secondary Schools

School name	Total no. of students	Waste generated (kg)	Waste generated (kg/person)
*Anwar-ul-Islam Secondary Schools(Junior/Senior)	950	268.4	0.28
Methodist Grammar School(Junior/Senior)	1,545	108	0.07
Immanuel College Senior School 1	1,155	72	0.06
Immanuel College Junior School 1	300	17	0.06
Immanuel College Senior School 2	110	0	NA
Immanuel Grammar School	683	0	NA
Total	4,743	465.4	Mean = 0.12±0.11

**Early starter*

A total 76 creative products were entered into the "Creative Reuse Challenge". Three top products were selected alongside 11 products for consolation award in the primary while in the secondary school three top products and 18 products were selected for consolation award. An award ceremony was organized by NEST and GCC at the end of the school term. The award featured an exhibition of creative/innovative products entered into the "Creative Reuse Challenge". Schools that accrued the highest amount of PWA and PET for the total duration of the programme were presented with incentives that will improve the sanitary and hygiene condition of the schools. Also awards were presented to students whose creative/innovative products were adjudged outstanding by the panel.

There was an increase in the level of responsibility assumed by stakeholders to ensure proper disposal of waste generated from the consumption of beverage containers (PWS and PET). This was evident in the roles they agreed to play in the success of the programme (shown in the RACI chart). This has been seen in different countries where buy-back initiatives thrive such as 'Don't Waste. Create': Campaign Rewards Customers for Recycling in the United Kingdom by Coca-Cola (coca-cola, 2013); Canadian Beverage Container Recycling Association (CBCRA) Manitoba Program Plan (CBCRA, 2011); Plastic Recycling Awareness among students at University of Califonia, Berkeley (Rachel Abramson, 2008). However, 70% participation rate was recorded amongst stakeholders for this study.

A total of 969kg of PWS and PET were collected from the schools, which is a distant progress from the previous state of things where waste were dumped at the school dumpsite and burnt under favorable condition. The population of the school was not directly proportional to the total amount of waste accrued, although some of the schools with the highest population were able to more waste (Tables 4 and 5). Findings from interview with coordinating teachers in target schools revealed that, the teachers as well as students worked together to ensure that PWS and PET were collected daily from the school and domestic premises. This was the singular factor that distinguished the top schools that accrued the highest amount of waste. Though the level of knowledge on waste recycling and resource recovery was not assessed, there was the general perception that an incentive buy-back programme for recycling of end-of-life products might inspire sufficient motivation for an attitudinal change in waste management, both for consumers and waste managers in Nigeria.

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