Impact of Disposed Drinking Water Sachets in Damaturu, Yobe State, Nigeria

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II. HISTORY

Abstract-Damaturu is the capital of Yobe State in northeastern Nigeria where civic amenities and facilities are not adequate even after 24 years of its existence. The volatile security and political situations are most significant causes for the same. The basic facility for the citizens in terms of drinking water and electricity are not available. For the drinking water, they have to rely on personal boreholes or the filtered borehole waters available in packaged sachets in market. The present study is concerned with environmental impact of indiscriminate disposal of drinking synthetic polythene water sachets in Damaturu. The sachet water is popularly called as "pure water", but its purity is questionable. Increased production and consumption of sachet water has led to indiscriminate dumping and disposal of empty sachets leading to serious environmental threat. The evidence of this is seen for sachets littering the streets and the drainages blocked by 'blocks' of water sachet waste. Sachet water gained much popularity in Nigeria because the product is convenient for use, affordable and economically viable. The present study aims to find out the solution to this environmental problem. The fieldbased study has found some significant factors that cause environmental and socio economic effect due to this. Some recommendations have been made based on research findings regarding sustainable waste management, recycling and re-use of the non-biodegradable products in society.

Keywords—Civic amenities, non-biodegradable, pure water, sustainable environment, waste disposal.

I. INTRODUCTION

CUSTAINABILITY of the environment is an important D factor influencing sustainable socioeconomic development of any community. However, anthropogenic practices have contaminated environment to such an extent that managing and maintaining healthy environmental conditions has become a worldwide problem. The present study is concerned with environmental impact of indiscriminate disposal of empty water sachets in Damaturu town, located in the northeastern part of Nigeria in Yobe State. Sachet water entails the packaging of drinking water in a non-biodegradable synthetic polyethylene (polythene). Sachet water, popularly called "pure water" in Nigeria is a necessity. Sachet water gained much popularity in Nigeria because the product is convenient for use, affordable and economically viable. Increased production and consumption of sachet water has led to indiscriminate dumping and disposal of empty sachets leading to serious environmental threat. The evidence of this is seen for sachets littered on the streets and the blocked drainages by heaps of water sachet waste.

History reveals that sachet water was introduced to the Nigerian markets around 1990 but its regulation by the National Agency for Food and Drug Administration and Control started in 2001. It registered 134 different packaged water producers in Nigeria [1]. Coincidentally, between 1992 and 1996, the years that sachet water production began to sprout, the rate of increase of the country's total water supply for industrial, agricultural and domestic uses was 1.0 percent while the population growth rate was 2.84 percent [2]. According to [3], inability of the Government to provide persistently adequate potable water for the growing population tremendously contributed to the proliferation of the so-called 'pure water' producers in Nigeria. Thus, production of sachet water came up as a solution to the dearth of potable water provision. As the country population grew and industries increased, the supply of water by the public utilities became inadequate in quality and quantity. This led to the emergence, and proliferation of more and more private water enterprises that operated side by side with the government-owned public water utilities.

III. PRODUCTION OF SACHET WATER

Small, medium and large-scale industries are scattered around the breadth of Nigeria that manufacture packaged water sold as sachets (commonly referred to as pure water). Thousands of brands of thermoelectrically sealed nylon sachets containing about 0.5L water have increased tremendously in Nigeria. This form of water started as simply hand tied nylon pouches of treated or untreated coldwater. Treatment then was simple. Absorbent pads (referred to as 'foam') were used to trap all the dirt and germs. It was largely effective for removal of suspended solids. Now the packaging of this sachet water is done by machine. The sachets are made of non-biodegradable synthetic polyethylene (polythene), which does not decay, decompose or corrode, and which when burnt, produces oxides of carbon, nitrogen and sulphur. However, the water sources and purification technologies are not up to the safe standards. Sources of water are generally surface and ground water. National agency for food, Drugs, Administration and control (NAFDAC) approved tap water (surface water), borehole (ground water) and spring water as sources of raw water for packaged water production [4]. Surface water and underground water from boreholes and springs are subject to contamination from animal wastes, pesticides industrial wastes and many other organic materials. It must be noted that there is no single water treatment technique or devise treat all problems because they

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are subject to limitations [5]. However, there is no or little effective treatment process involved in packaging sachet water in Nigeria.



Fig. 1 Process of Packaging Sachet Water

A. Material Used for Sachet Water Packaging

The packaging of this sachet water is made of nonbiodegradable synthetic polyethylene (polythene), which does not decay, decompose or corrode, and which when burnt, produces oxides of carbon, nitrogen and sulphur.

IV. CONSUMPTION OF SACHET WATER

Nigeria total landmass is 923,768 Km2 and from the calculations, it is obvious that the country generates approximately about 990,344 Km2 (area) of sachet water waste daily which is larger than the total landmass of the country. It was noted that about 70 percent of Nigerian adults drink at least a sachet of pure water per day resulting in about 50 to 60 million used water-sachets disposed daily across the country [6].

V.DISPOSAL OF EMPTY WATER SACHETS

The daily average need of water for man is between 2-3 litres for drinking alone. The average consumption is 2.5litres per day i.e. approximately 4.5 packs (60cl) consumed per day, which translates to generating 4.5 empty sachets of waste per person per day. The average area of a sachet water pack is approximately 0.0211ml (Table I). The empty water sachets are not segregated before disposal. Rather they are thrown outside the house premise or any common area of garbage dump within a locality, mixed with other decomposable and non-decomposable waste items.

| TABLE I | | | | | |
|---|------------------|--------------------------|--------------------|--|--|
| WATER SACHET WASTE GENERATED IN THE STATES OF NIGERIA | | | | | |
| Rank | Nigerian state | generated (nonulation x | Km2 (sachet area x | | |
| rtunit | i tigerian state | sachet consumed per day) | waste generated) | | |
| 1 | Kano | 37534728 | 791.983 | | |
| 2 | Lagos | 36054136 | 760.742 | | |
| 3 | Kaduna | 24266248 | 488.894 | | |
| 4 | Katsina | 23170312 | 488.894 | | |
| 5 | Oyo | 22366356 | 471.930 | | |
| 6 | Rivers | 20741600 | 437.648 | | |
| 7 | Bauchi | 18705860 | 394.694 | | |
| 8 | Jigawa | 17394596 | 37.029 | | |
| 9 | Benue | 16876976 | 356.104 | | |
| 10 | Anambra | 16728128 | 352.964 | | |
| 11 | Borno | 16604772 | 350.361 | | |
| 12 | Delta | 16393564 | 345.904 | | |
| 13 | Niger | 15800972 | 333.401 | | |
| 14 | Imo | 15739596 | 332.105 | | |
| 15 | AkwaIbom | 15680832 | 330.866 | | |
| 16 | Ogun | 14912392 | 314.651 | | |
| 17 | Sokoto | 14787996 | 312.027 | | |
| 18 | Ondo | 13764096 | 290.422 | | |
| 19 | Osun | 13694140 | 288.946 | | |
| 20 | Kogi | 13113948 | 276.704 | | |
| 21 | Zamfara | 13039384 | 275.131 | | |
| 22 | Enugu | 13029192 | 274.916 | | |
| 23 | Kebbi | 12954512 | 273.340 | | |
| 24 | Edo | 12873328 | 270.627 | | |
| 25 | Plateau | 12714848 | 268.283 | | |
| 26 | Adamawa | 12672404 | 267.388 | | |
| 27 | Cross River | 11555864 | 243.829 | | |
| 28 | Abia | 11335996 | 239.190 | | |
| 29 | Ekiti | 9536848 | 201.227 | | |
| 30 | Kwara | 9484356 | 200.120 | | |
| 31 | Gombe | 9415516 | 198.667 | | |
| 32 | Yobe | 9286364 | 195.942 | | |
| 33 | Taraba | 9202944 | 194.182 | | |
| 34 | Ebonyi | 8694004 | 183.443 | | |
| 35 | Nasarawa | 7453100 | 157.260 | | |
| 36 | Bayelsa | 6813432 | 143.763 | | |
| 37 | FCT | 5620804 | 118.599 | | |

VI. PROBLEMS ASSOCIATED WITH DISPOSAL AND DUMPING OF EMPTY WATER SACHETS

The problem of solid waste disposal is alarming in urban centres of the developing countries and is a major concern to the government. This problem of municipal waste generation and disposal is worrisome in Nigeria where it is always on the increase because of increasing population pressure and socioeconomic factors. Several environmental impacts including blockage of waterways and choking of animals, soils and mosaic litters of pure water sachet in the landscape requires urgent attention [7]. Nigeria total landmass is 923,768 Km2 and from the calculations, it is obvious that the country generates approximately about 990,344 Km2 (area) of sachet water waste daily which is larger than the total landmass of the country. The effects includes Increase disease transmission, contamination of ground and surface water, generation of greenhouse gas emissions and other air pollutants, damage to

ecosystems, injury to people and properties [8]. Rapid urbanization, rural-urban migration, little or no town planning efforts coupled with attitudinal irresponsibility, lack of political will, ineptitude and graft have independently and collectively created environmental challenge in Nigeria resulting to human or solid waste decorating streets and public space everywhere in Nigeria [9]. These results in extreme health hazards to people exposed to them. Such conditions can precipitate epidemics and national health crises [10]. Disposal of waste generated from the production and consumption of packaged water, including sachet water, constitutes an aspect of health and environmental hazards [11].

VII. STUDY AREA

Damaturu is the Yobe State capital which is located in the North Eastern Nigeria with the following geographical coordinates; 110 44' 55"North and 110 57' 50" East. The state capital has a total area of 2,366km2, and an estimated population of 44268 based on the 2006 Nigerian Census figures [12].

VIII.OBJECTIVES

- A. To know the environmental impacts of disposal of empty water sachets in Damaturu.
- B. To know the health impacts of disposal of empty water = sachets on the people of Damaturu.

IX. RESEARCH METHODOLOGY

Both the personal field survey and secondary data sources were used in the research .Simple random sampling was used to select respondents for interview .Njiwaji/ Gwange, Nayinawa, Damakasu, Murfakalam, Kallalawa/ Gabai, Sasawa/ Kabaru, Bindigari/ Pawari, Gambir/Moduri, Kukareta, Damaturu central and Maisandari are the eleven wards of Damaturu. From each ward forty households were interviewed which makes a total of 440 respondents. Therefore, 440 respondents were interviewed through questionnaire to find out

- A. Amount of sachet water they use in a day or amount of waste generation in Kg per capita per day.
- B. Place where they dump the empty sachets
- C. Are they aware of any environmental and health problems related to disposal of empty sachets?
- D. Do they have any of the health problems related to disposal of empty sachets?
- E. Do they experience any environmental problem due to disposal of empty sachets?

X.RESULTS AND DISCUSSION

A. Nylon or cellophane is non-biodegradable but its strength while in water or soil deteriorates with time. During the deterioration period, the chemicals with which, the cellophane is composed are gradually released and thus polluting the soil or water for upward of 40 years. Therefore, the amount of sachet waste generated influences the level of environmental threat. Table II shows sachet waste generation per day per capita in the wards of Damaturu.

- B. The study conducted revealed that in Damaturu except Damakasu, Damaturu central and Sasawa/ Kabaru wards the disposal of sachet waste is not organised. 66 % of the total waste generated is littered on streets, grounds or backyards of residences and drains. 11 % is burnt, 3% is buried, 14% is put into public bins and remaining only 6% is reused.
- C. Out of the total respondents, only 63% of the respondents were aware of environmental and health impacts of sachet waste disposal. Out of this 63%, 22% are females and 78% are males.
- D. Common health problems associated with disposal of sachet waste are respiratory problem such as asthma, nausea due to foul odour from drains and burning of sachets, typhoid and stomach ulcer due to contamination of water through dumped empty sachets near water sources and dermatological problems. From the study, it was revealed that 77% of the respondents had at least one of these health problems. Table III shows health problems from which the respondents are suffering.

| TABLE II |
|---|
| GENERATION OF SACHET WASTE PER DAY PER CAPITA IN THE WARDS OF |
| DAMATURU |

| Wards | Kg/capita/day | Average no. of persons in a house |
|------------------|---------------|-----------------------------------|
| Njiwaji/Gwange | 0.57 | 7 |
| Nayinawa | 0.5 | 6 |
| Damakasu | 0.3 | 5 |
| Murfakalam | 0.4 | 7 |
| Kallalawa/Gabai | 0.55 | 9 |
| Sasawa/Kabaru, | 0.5 | 7 |
| Bindigari/Pawari | 0.3 | 6 |
| Gambir/Moduri | 0.3 | 6 |
| Kukareta | 1 | 10 |
| Damaturu central | 1.20 | 11 |
| Maisandari | 0.4 | 7 |

Source: Personal Field survey (2015)

TABLE III

HEALTH PROBLEMS FROM WHICH THE RESPONDENTS ARE SUFFERING

| Health Problems | Percent of respondents |
|---------------------------|---------------------------|
| Nausea | 38 |
| Asthma | 19 |
| Typhoid and stomach ulcer | 35 |
| Dermatological problems | 8 |

Source: Field Survey (2015)

E. Environmental impact: whether sachet waste disposal affects environment negatively or not can be well understood by respondent's perception and awareness regarding the problem.

The questionnaire was constructed using a five (5) point likert scale as follows: Strongly Agreed (SA) = 5 points, Agreed (A) = 4 points, Undecided (UD) = 3 points, Disagreed (D) = 2 points, Strongly Disagreed (SD) = 1 point.

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$$X = \frac{\Sigma F x}{N}$$

where X = Mean, $\sum = Summation$, Fx = Frequency of x, N = Number of occurrence.

The cut-off point is determined by summing the nominal values and dividing it by the total number of scaling items. Thus: 5+4+3+2+1 = 15/5 = 3. Any item that had a mean score of 3 or more was accepted and that had less than 3 was not accepted.

| RESPONDENT'S PERCEPTION AND AWARENESS REGARDING ENVIRONMENTAL PROBLEMS | | | | | | | | |
|--|---|-----------------|----------------|----------------|--------------|---------|------------|----------|
| S. N. | Environmental Problem | 5 SA | 4 A | 3 UD | 2 D | 1 SD | Mean Score | Remark |
| 1 | Air pollution due to burning of polythene | 295 (67.04%) | 47 (10.68%) | 53 (12.03%) | - | - | 4.11 | Accepted |
| 2 | Water pollution (underground water contamination) | 195 (44.26) | 94 (21.33) | 73 (16.5) | 15 (3.05) | - | 3.58 | Accepted |
| 3 | Sewage and drain blockage | 301 (68.32) | 62 (14.07) | 45 (10.21) | - | - | 4.26 | Accepted |
| 4 | Overflow of dirty water from drains | 176 (39.95) | 94 (21.33) | 89 (20.20) | 16 (3.63) | - | 3.5 | Accepted |

TABLE IV

XI. CONCLUSION

From the above analysis, it is evident that both health and environmental problems are faced by the people of Damaturu. Managing solid waste is a serious problem in Damaturu especially that of empty water sachet waste which accounts for serious environmental and health threats. Suitable strategies are required to attend and solve this problem.

| TABLE V | | | |
|--|--|--|--|
| SUGGESTIONS AND EXPLANATION AS STRATEGIES FOR WATER SACHET | | | |
| WASTE MANAGEMENT [13] | | | |

| Suggestions | Explanations | | |
|---|---|--|--|
| Reuse | For nursing seedling | | |
| Recycling | Transforming thrash into raincoats, bags etc. | | |
| Cash your thrash system | Monetary reward for sorting water sachet waste | | |
| Outright ban | Ceasing producers from the use of non- biodegradable material to package water. | | |
| Increase in equipments | Increases the efficiency of institutions responsible for sachet water plastic waste. Adequate supply of dustbins at vantage points to discourage littering | | |
| Frequent organization of community clean up exercises | To keep surroundings of the community clean and tidy | | |
| Use of biodegradable materials to package water | Reduce the cumulative effect of littering of plastic material | | |
| Polluter pay principle | Targeting producers and consumers of plastics | | |

Creation of awareness among the people regarding environmental threats and its implication on human health is of utmost importance. Public participation in managing waste can be started at household level by segregating the nondecomposable wastes especially empty water sachets from the other wastes generated at households.

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