

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

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II. HISTORY

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 insecticides 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

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 field-based 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

SUSTAINABILITY of the environment is an important 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.

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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.

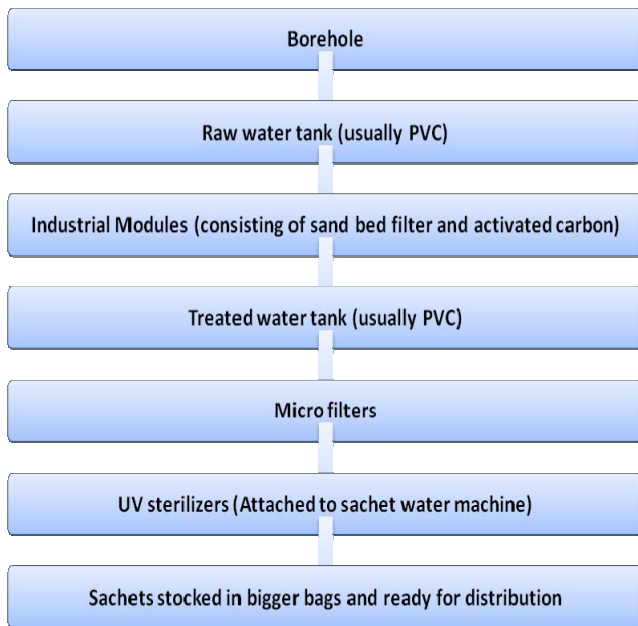


Fig. 1 Process of Packaging Sachet Water

A. Material Used for Sachet Water Packaging

The packaging of this sachet water is made of non-biodegradable 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	Water Sachet waste generated (population x sachet consumed per day)	Area covered by waste Km ² (sachet area x 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	Akwabom	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.

$$X = \frac{\sum Fx}{N}$$

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.

TABLE IV
 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

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. Increases the efficiency of institutions responsible for sachet water plastic waste.
Increase in equipments	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 non-decomposable wastes especially empty water sachets from the other wastes generated at households.

REFERENCES

[1] J.I. Onemano, and J.A. Otun, "Problems on Water Quality Standards and Monitoring in Nigeria", Paper presented at the 29th Water, Engineering and Development Centre International Conference, in Abuja, Nigeria, 2003.
 [2] N. Gbadegesin and F. Olorunfemi, "Assessment of Rural Water Supply Management in Selected Rural Areas of Oyo State", ATPS Working Paper Series No. 49, 2007.
 [3] D.N. Akunyili, "The Role of Pure Water and Bottled Water Manufacturers in Nigeria", Paper presented at the 29th Water,

Engineering and Development Centre International Conference, in Abuja, Nigeria, 2003.
 [4] T. Abati, "Water Sources and Treatments", Food Forum, Nigerian Institute of Food Science and Technology, September, 2005, P.10.
 [5] Geo Insight : A Primer on Small Water Treatment Method, Point of Entry and Point of Use System infor@geo inc.com, 2003.
 [6] M.O. Edoga, L.I. Onyeji and O.O. Oguntosin, "Achieving Vision 20:2020 through Waste Produce Candle", Journal of Engineering and Applied Sciences, 3(8), 2008, pp. 642- 646.
 [7] P.A. Ogwo, L.O. Obasi, D.S. Okoroigwe, and N.O. Dibia, "From Plastic bag wastes to wealth: A case of Abia State University, Nigeria", Journal of Environmental Management and Safety 1(1), 2013, pp. 35-39.
 [8] D.J. Idiata and J. U. Iyasele, "The Environmental threat of sachet Water package (waste) on agricultural land", Journal of Multidisciplinary Engineering Science and Technology (JMEST), Vol. 1 Issue 4, 2014, p. 81.
 [9] B.A. Oyeniyi, "Waste Management in Contemporary Nigeria: The Abuja Example", International Journal of Politics and Good Governance 2(2,2), 2011, pp. 1-18.
 [10] A.O. Adenuga, K. Ogujiuba and F.K. Ohuche, Sustainability of the Environment and Water Pollution in Nigeria: Problems, Management and Policy Options. Global Journal of Environmental Sciences, 5(1), 2006, pp. 49-59.
 [11] R. Akunyili, Plastics Recycling: Products and Processes, Hanser Publishers, Munich. Environment and Plastics Industry Council (EPIC). Plastic Recycling Overview. Summary Report by Environment and Plastics Industry Council (EPIC): A Council of the Canadian Plastic Industry Association, 2003.
 [12] National Population Commission of Nigeria "Provisional Figures for Census, Vol. 1, 2006, p. 22.
 [13] A.K. Yahaya, "Stirring the Stagnant waters: the Effect of Disposal and Management of used Sachet Water polythene bags in the Sokpayiri community of Wa Municipality of Ghana", World Journal of Arts, Languages, and Social Sciences; 1(2), 2012, p.11.