

HUMAN ADJUSTMENT TO THE DRY SEASON WEATHER OF THE SUDANO-SAHELIAN ENVIRONMENT: A CASE STUDY OF MAIDUGURI METROPOLIS

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Abstract

The paper evaluated the climatic culture of the dry season in the sudano-sahelian environment and its deterministic influence on human physiologic comfort and health. The influence of the climatic vagaries on the performance of humans in this bioclimatic zone is also presented. A descriptive cross-sectional survey was conducted in Maiduguri in January, 2002 to evaluate people's response to weather in the city. The study used a multi-stage sampling technique to select and administer 1200 instrument of the survey to the eligible respondents in four wards of the city proportionately. The wards (proportions) are; Gwange (450), GRA (150), Mairi (300) and Bulunkuttu (300). The dry season in the sudano-sahelian environment presents two distinct thermal opposites. The harmattan season (October-March), which is cold and the hot (transitional) season (April-early June), which presents debilitating hot conditions. These two seasons have created two distinct climate cultures among the inhabitants of the area in response to the vagaries of the weather. It was found that humans have some ways of adjusting and overcoming the problems posed by the harsh dry season weather of the sudano-sahelian zone. The measures adopted during the cold harmattan include warm dressing, heating and mating. While the set of measures adopted during the hot season include resting under trees in the late mornings and the afternoons, sleeping outside in open spaces at night, wetting of beddings, floors and building walls and creating artificial micro-weather through fanning and air conditioning. The weather vagaries mitigation measures are however, paradoxically associated with some social and health problems like burglaries, theft, increased incidences of sexually transmitted diseases and burns. These affect both human and land productivity in this environment negatively. Some aspects of the adjustment to the cold weather have some adverse environmental effects. For example, heating and warming processes in the home and outside have usually meant more exploitation of vegetal resources. This leads to, among other things, deforestation and soil erosion and also atmospheric pollution. This study therefore, recommends that the residents of the city should be educated on the danger and on how to avoid the adverse effects of some weather vagaries adjustment measures. Also, government should ensure the availability of anti-snake venom as part of the essential drugs in the health centers. Security should also be tightened during the hot season to check thefts and burglaries.

1. Introduction

Climate is the most fundamental environmental factor that affects human beings. Its sphere of influence encompasses the entire imaginable realm of human endeavours. Man's health and productive activities like agriculture, transport, trade and commerce and even a mere decision about the type of dress to wear, his successes and failures are all determined to a very great extent by the prevailing weather condition of the environment in which he lives.

The climate of the semi-arid region of Nigeria is, as in most tropical areas, characterized by two distinct weather scenarios – the prevalence of wet and dry periods. Rainfall availability is then the main determining factor of this seasonal division. The rainy season commences when the inter-tropical discontinuity is about its northern most limit. The rainy season begins in late May or early June and lasts till late September or early October. The rains here, like in most semi-arid environments, are generally scanty and highly erratic in nature. The mean annual precipitation is 700 mm and it is characterized by high variability. It varies between 375 mm to 2,000 mm. This, coupled with the high evaporation rate of about 1930 mm (FAO, 1984) and other factors make the area to be generally semi-arid and thus, highly susceptible

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to drought, threats of desertification and soil loss through wind erosion (Odihi, 1988; Gisilanbe, 1995).

The dry season on the other hand covers most part of the year, beginning from late September or early October to early June. This season is characterized by two distinct periods – the harmattan and the hot (transitional) periods, both of which represent two extremes of weather (Gisilanbe, 1990). The harmattan period is characterized by very low relative humidity and temperatures. The temperatures drop to as low as 15°C at night under clear skies. The air is generally very dusty, especially in the night and in the morning with the dust concentrating more towards the ground under calm conditions, and thus, impairing visibility (Odihi, 1988). The harmattan dust chokes and hence living in it makes the eyes to water as if affected by diffused spray of tear-gas (Adefolalu, 1984). The cold dusty harmattan period is also associated with increased respiratory diseases such as sore throat, bronchitis, pleurisy and other diseases of the respiratory tract (McKeown, 1956; Adefolalu, 1984; Rasheed, 1985; Gisilanbe, 1990), dryness of the skin and chapped lips.

The transitional period on the other hand lasts from late March to May/June. It is also characterized by low relative humidity but very high temperatures. Daytime temperatures are generally above 40°C. Sandstorms are the common weather events during this period. The sandstorm usually occurs in the late afternoon (Gisilanbe, 1990; 1995) and is accompanied by low temperatures and reduced visibility (Dubief, 1979). This period, like the harmattan season, poses some health problems to the inhabitants of the area. Respiratory health problems are common during this period. The sandstorms pollute the air and spread air-borne diseases, since suspended dust is a major carrier of vectors. Apart from enhancing the spread of respiratory diseases, the transitional period is also characterized by increased incidence of eye diseases, headaches, prickly heat and diaper rashes (Gisilanbe, 1990). However, the most important effect of the weather on humans at this time of the year is best seen in terms of its influence on physiologic comfort of the people. The high temperatures (generally between 40 and 48°C) make life very uncomfortable for the inhabitants especially, during the day time. The nights are however, milder as temperatures drop to as low as 25°C.

Generally speaking, the dry season in the sudano-sahelian environment represents a very bad weather. Hence, ill-health precipitated by weather events and physiologic discomforts are fundamental characteristics of the season. The inhabitants of this environment are aware of these weather precipitated morbidity and physiologic comfort. Over the years, they have evolved some forms of adjustments to the vagaries of the weather. These adjustments, as varied as they are, have some far-reaching consequences on man and the environment. This paper primarily focuses on the identification of the type of adjustment measures employed by the people against the vagaries of the dry season and the problems associated with these adaptive practices on both man and the environment.

2. Methodology

The data used for the study include information on the awareness of the weather-precipitated health problems prevailing in the environment and the “climatic culture” that the people have evolved as mitigation measures to the weather problems. An interview schedule using structured questions was used in January, 2002 to gather this information. The interview schedule was administered to a total of 1200 respondents in four wards of the Maiduguri

metropolis namely; Mairi, Gwange, GRA and Bulunkutu. The criterion for inclusion of the respondents in the study was the attainment of the age of fifteen years.

A multi-stage sampling method was used to select the respondents. Although the wards were randomly selected, they nevertheless represent the different socio-economic classes of the city. The sample size of each ward was based on the size of the population of the ward. Thus the sample sizes were 450 for Gwange, 150 for GRA and 300 each for Mairi and Bulunkutu wards. In each of these wards, the sample blocks and the starting point (household) in each block were randomly selected. The actual administration of the interview was carried out continuously until the sample size for the block was obtained. The process was repeated until the sample size for all the wards was exhausted.

Simple percentages were used to estimate the number of persons that adapted each adjustment type and also the level of the impacts of the adjustment on man and the environment.

3. Findings and discussion

As earlier mentioned, the dry season in the Sudano-sahelian zone presents two distinct thermal opposites. Both are harsh conditions affecting human health and physiologic comfort. However, their influence on health and physiologic comfort as well as the "climate cultures" evolved by the people differ.

3.1 Adjustment to the harmattan weather

The characteristics of the harmattan weather and its effects on man's health and comfort have earlier been identified. The following measures are often taken by the inhabitants of Maiduguri as a means of adjustment to the cold and dusty conditions of the harmattan weather.

For the harmattan precipitated disease conditions, amelioration measures often involve medication. This is however not sought by all persons and for some, not for all morbidity conditions. Some people believe that some diseases like cold, catarrh or running nose have no medication as they come and go at any time during the harmattan season and so they seldom seek medical advice whenever they contract these diseases. Their reasoning, though without any scientific basis, is anchored perhaps on their experiences with these diseases. At times, these diseases get cured with just a simple medication or sometimes seem to defy even the most potent drugs. There is another group of people that do not go to hospital and generally do not take medicine for religious reasons. They believe prayer is the answer to all human problems including ill-health.

Even for the group that use to take some form of medication, some do not take drugs prescribed by qualified medical personnel. About 24 percent of the population belongs to this group. They practice what is commonly referred to as self-medication. One interesting thing about this self-medication is that more often, the wrong management practice is applied. It is either a wrong drug is taken or the wrong dosage of the right drug is used. The consequences of both are certainly grave. The disease is seldom cured, and when this happens, the person begins to think that the disease has no cure. The study found that most of

the people who claimed that the harmattan weather-related diseases do not have cure developed their thoughts after a self-medication failed, often after a series of trials.

The distribution of people's attitude towards medication for harmattan-precipitated diseases in the study is presented in Table 1.

Table 1: People's attitude towards medication for harmattan-precipitated diseases in Maiduguri

Ward	Sample size	Those who take medications				Those who do not take medications	
		Prescribed		Self medication		No	%
		No	%	No	%		
Mairi	300	150	50.00	105	35.00	45	15.00
Gwange	450	240	53.33	120	26.66	90	20.00
GRA	150	120	80.00	6	4.00	24	16.00
Bulunkutu	300	210	70.00	60	20.00	30	10.00
Total	1200	720	60.00	291	24.25	189	15.75

The table above reveals that 60% of the people used to seek for medical advice and take prescribed drugs for harmattan-precipitated diseases. About 24% of the people of Maiduguri practise self medication for the treatment of harmattan-precipitated diseases, while 16% do not take any form of medication at all. Therefore, as a way of overcoming the discomforting cold of the harmattan season, the following adjustment measures are adopted: use of heavy (thick) clothing or covering sheets especially at night and in the morning, bathing with warm water, use of fire in the room at night and in the open places in the morning (using mostly grasses and stalks of corn, woodfuel or charcoal), use of room heaters and mating. Table 2 presents a summary of the adjustment measures used by the people in overcoming the cold harmattan weather.

Table 2: People's adjustment to the cold harmattan weather in Maiduguri

Ward	Sample size	Use of thick covering sheet	Use of fireplaces		Use of room heaters	Mating
			Overnight	Morning		
Mairi	300	300	60	120	3	170
Gwange	450	450	250	360	30	246
GRA	150	150	9	75	40	60
Bulunkutu	300	300	54	174	4	153
Total	1200	1200	373	729	77	629

From Table 2, one can discern the complexity of adjustment measures adopted by the people in overcoming the harmattan cold. The inhabitants of Maiduguri use a multiplicity of adjustment measures. For example, all the people either use thick clothing or covering sheets in the night and in the morning hours. Sometimes this may extend into later parts of the day or even throughout the day. Also, a person could cover himself and yet have a fireplace in the room in the night and set one in the open in the morning. Yet again, one can adopt the mating measure and still employ the other measures as well.

3.2 Adjustment to the Hot Weather

As a means of overcoming the extremely harsh weather of the hot season, the people of the sudano- sahelian environment have adopted the following adjustment measures: getting medication for heat and dust precipitated-diseases, resting under tree-shades (especially in the afternoon), sleeping out in the open at night, wetting of beddings and floors and sprinkling water on walls of buildings especially in the late afternoon. Other adjustment measures include the use of artificial room weather modifiers such as the locally made hand fans, electric fans and air-conditioners to create artificial micro weather.

However, due to the extreme nature of the heat during this period (temperatures may be as high as 45° - 50°C during the day time and generally above 22°C at night), effective heat mitigation can only be achieved by an air-conditioner that is in a perfect working condition. It often takes a combination of two or more of the other heat amelioration measures to overcome the heat to a certain extent, especially during the peak heat period of the afternoon in the months of May and June. Despite this fall in temperature at night, the people still adopt a multiple of mitigation measures in order to sleep well. For example, they at times combine sleeping outside the rooms with the use of fans to create conducive micro-weather and also in addition to drive away mosquitoes. They also combine sleeping outside and the wetting of sleeping materials or any other suitable combination. The adjustment measures adopted by the people in overcoming the heat of the hot season are presented in Table 3.

The result of the analysis shows that most of the inhabitants of Maiduguri adjust to the heat of the hot season by using fans (68%), sleeping outside at night (65%) and also by resting under trees during the day time (58%). It should be noted however that, these adjustment measures are often employed in a form of combinations. This is because with the exception of air conditioners, none of the other heat mitigation measures is very effective in combating the terrible heat in Maiduguri. But the air conditioner is very expensive to acquire. This perhaps explains why it is currently used by only 18% of the population.

Table 3: Adjustment measures used by Maiduguri inhabitants in mitigating the heat of hot season, January, 2002

Ward	Sample size	Type of adjustment measure used													
		Resting under tree		Sleeping outside at night		Wetting of beddings		Wetting of floors		Wetting of building walls		Use of fans		Use of air conditioners	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%
Mairi	300	174	58.00	210	70	20	6.66	13	4.33	0	0.00	186	62	15	5.00
Gwange	450	322	71.55	375	83.33	45	10.00	20	4.44	0	0.00	306	68	45	10.00
GRA	150	40	26.66	20	13.33	5	3.33	3	2.00	2	1.33	150	100	135	90.00
Bulunkutu	300	159	53.00	180	60.00	15	5.00	7	2.33	0	0.00	177	59	24	8.00
Total	1200	695	57.91	785	65.40	85	7.08	43	3.58	2	0.16	819	68.25	219	18.25

could be suggested such as gas, electricity and kerosene are too expensive. Other alternatives such as wind and solar energy are equally out of reach of most of them either due to general lack of the technology or the abject poverty condition that makes it practically impossible for them to acquire those technologies.

3.3.2 The effects of the Hot Season Weather Mitigation Measures

Adjustment to the hot season weather also precipitates a number of negative consequences. These include health risks such as incidence of snake bites and scorpion stings, and socio-economic consequences such as loss of property due to burglaries and rising utility (water and electricity) bills. These effects are elaborated below.

a) Prevalence of Snake Bites and Scorpion Stings

The prevalence of snake-bites is generally very low in the study area. However, there is a slight rise in the number of cases during the hot season which can be attributed to two factors. Firstly, the prevailing weather condition and secondly, the people's technique of adjustment to the prevailing weather condition.

The hot season is characterized by very high temperatures. This makes the soil temperature to be very hot and thus, forcing the reptiles to leave their burrows for the cooler surface. Places such as flower beds, hedges, trees and even rooms provide a ready and conducive habitat for them. This makes the residents more vulnerable to bites by these reptiles. The second reason for the rise in the incidence of snake-bites during the hot season is the attitude of the people. The harsh weather condition of the hot season makes it impossible for many people to sleep in their rooms. They sleep out in the open thus, increasing the chances of coming into contact with reptiles and hence increasing the risk of being bitten.

Scorpion stings on the other hand are generally more prevalent than snake bites. Although the incidence of scorpion stings occurs all through the year, it reaches its peak during the hot season. Table 5 shows the incidence of snake-bites and scorpion stings in Maiduguri.

Table 5: Prevalence of snake-bites and scorpion-stings in Maiduguri

Ward	Size	Snake bite				Scorpion sting			
		Harmattan season		Hot season		Harmattan season		Hot season	
		No	%	No	%	No	%	No	%
Mairi	300	0	0.00	2	0.66	3	1.00	32	10.66
Gwange	450	1	0.22	2	0.66	9	2.00	58	12.88
GRA	150	0	0.00	1	0.22	1	0.66	8	5.33
Bulumkuttu	300	0	0.00	0	0.00	2	0.66	29	9.66
Total	1200	1	0.08	4	0.33	15	1.25	127	10.58

The result of this study shows that only about 0.41% of the population had snake bites. And about 80% of these bites occurred during the hot season. As regards scorpion stings, though generally more rampant than snake bites, is also more prevalent during the hot season. Generally, about 11.58% of the populations have experienced scorpion stings. The study also found that about 90% of the stings occurred during the hot season with over 97% of the cases occurring at night.

b) Burglaries and thefts

The most important social problem associated with the adjustment measures is the case of property losses resulting from burglaries and thefts. This is a consequence of sleeping out in the open as mitigation for the heat of the hot season. As people leave only minors, with the aged or nobody at all in their rooms, thieves capitalize on the situation and cart away some valuables. About 22.56% of the people have lost some valuables including money and properties while sleeping outside their rooms during the hot season. Hundreds of thousands of naira are estimated to be lost annually as a result of this.

4. Conclusion

The thermally opposite weather conditions of the dry season in this environment produce two distinct climatic cultures. These climatic cultures manifest in the people's daily life-the type of food they eat, their mode of dressing, the way they sleep, etc. These climatic cultures happen as adjustment measures to the vagaries of the weather.

The adjustment measure adopted by a person is determined to a great extent by his economic capacity and the environment in which he finds himself. For example, the room weather modifiers such as heaters, electric fans and air-conditioners can only be used if one can afford them and also when there is power supply. Also the less capable a person is in acquiring these room weather modifiers, the greater the chances of him/her adopting a combination of the adjustment measures.

The choice of the combination of the adjustment measures and their complexity is also determined by the intensity of the weather condition. This is in turn determined by the environment and sometimes, by even man's background and culture.

The impact of the measure on man and the environment is also a function of the type and degree of adjustment measure adopted. This is also determined by the intensity of the weather condition to be ameliorated. For example, the colder the harmattan, the greater the intensity of heating, which in turn, means greater exploitation of the environment for dry

grasses, stalks or woodfuel. This worsens the consequence of soil erosion, drought and desertification.

The quest for weather condition amelioration has led to unguarded exploitation of the environmental resources most especially, forest resources (grasses and trees) for the provision of energy for heating during the harmattan season. This has some adverse effects on sustainable development in this fragile ecosystem. Similarly, man's ill-health and physiologic discomfort resulting from direct impact of the weather and indirectly as a consequence of an adjustment to the weather also have some implications for sustainable development in the sudano-sahelian environment.

This paper therefore suggests a serious look into the weather precipitated ill-health and energy crisis that characterize the sudano-sahelian environment. The study also recommends that the residents of the city be educated on the dangers of and on how to avoid the adverse effects of some weather adjustment measures. Government should also ensure the availability of anti-snake venom as part of the essential drugs in the health centres. Security should also be tightened during the hot season to check thefts and burglaries.

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