

Effects of Charcoal Production on Biophysical Environment

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Abstract: This study assessed the effect of charcoal production on the biophysical of environment of Abaji Area Council of the Federal Capital Territory, Abuja. Survey research design was adopted for the study. Two hundred respondents were selected by the use of the simple random sampling technique. Data of the study were collected through Environmental Impact of Charcoal Production Assessment Scale. Data of the study were analyzed using the descriptive statistics of frequency count, mean (\bar{x}) and simple percentage. Findings of the study revealed the effect of charcoal production on biodiversity resources, physical environment, and the health of residents of Abaji Area Council. It was recommended that jobs should be created by the Area Council Authorities to residents to combat the menace of poverty which is one of the major factors encouraging charcoal production as means of livelihood.

Key words: Biophysical, Charcoal, Environment

I. INTRODUCTION

Right from time immemorial, domestic energy has been used for human survival. Among the primitive sources of domestic energy is charcoal. Up till date, the use of charcoal for domestic energy is still practiced as approximately 14% of the world's domestic energy is associated with charcoal (Chidumayo & Gumbo, 2012). Likewise, its production aids rural incomes, tax revenue and employment (Onekon & Kipchirchir, 2012). The use of charcoal is mostly practised in developing countries most of which are concentrated in the African continent. This makes the production of charcoal a lucrative business. Approximately 63% of the world's production of charcoal are accredited to African countries due to its utilization in both rural and urban settlements (Gazull & Gautier, 2015).

In Nigeria, charcoal is popularly used in both rural and urban settlements due to the fact that it is less bulky, easier to transport, accessible, and burns more cleanly (smokeless). Apart from domestic use advantages, it significantly contributes to the nation's energy balance. It is also a source of household income, and alternative to other costly sources of domestic energy (Olarinde & Olusola, 2018).

Domestically, charcoal is used for cooking, heating, and in box irons for ironing of clothes, etc. Majorly, charcoals could be produced in three ways namely: use of earth kilns, masonry, and metal kilns. The production phases include cutting of trees, collection, sizing the wood, preparation of kilns, loading and unloading wood into kilns, bundling, and packaging (Absolom, 2014). These processes cannot be

disassociated from the destabilization of the forest ecosystem which invariably affects the biophysical environment. Hence, this study assessed the effect of charcoal production on the biophysical environment of Abaji Area Council of the Federal Capital Territory, Abuja.

Aim and Objectives of the Study

This study assessed the effect of charcoal production on the biophysical environment of Abaji Area Council of the Federal Capital Territory, Abuja. The specific objectives of the study were to:

- i. Assess the effect of charcoal production on biodiversity resources in Abaji Area Council.
- ii. Assess the effect of charcoal production on physical environment in Abaji Area Council.
- iii. Assess the effect of charcoal utilization on the health of residents of Abaji Area Council.
- iv. Assess the effect of charcoal production on socio-economic development of Abaji Area Council.

Research Questions

In line with the purpose of the study, the following research questions were raised:

- i. To what extent does charcoal production affect the biodiversity resources in Abaji Area Council?
- ii. To what extent does charcoal production affect the physical environment in Abaji Area Council?
- iii. To what extent does charcoal utilization affect the health of residents of Abaji Area Council?
- iv. To what extent does charcoal production affect socio-economic development of in Abaji Area Council?

Empirical Review

Kokou, Nuto and Atsri (2009) assessed the impact of charcoal production on the vegetation in Togo. The survey research design was employed, and data of the study were obtained through semi-structured questionnaires, oral interviews and group discussions (focus groups) which were analyzed using the descriptive statistics of frequency count, and simple percentage. It was discovered that charcoal production has negative effects on the natural ecosystems as a result of depletion of the biodiversity, density, height, diameter of the stands and basal area of the woody species.

Also, using the survey design, Anang, Akuriba and Alerigesane (2011) investigated the effect of charcoal production in Gushegu District of the Northern Region of Ghana. Data of the study were gathered through semi-structured questionnaires and focus group discussions. The data were analyzed using the descriptive statistics. It was discovered that charcoal production is an important economic activity in the study area involving mostly women as a means of livelihood. It also revealed deforestation, diminishing wildlife population, bush fires and soil nutrient depletion as the most critical environmental effects of charcoal production in the study area.

Lurimuah (2011) examined the economic and environmental effects of commercial charcoal production in the Upper West Region of Ghana. The survey design was adopted for the study. Both structured and unstructured questionnaires were used for data collection. The data were analysed using descriptive statistics. The study revealed that charcoal production is an income generating activity, although it presents severe environmental consequences to forest resources.

Absolom (2014) assessed the socio-economic impacts of charcoal enterprise in Narok-South Sub-County, Narok County, Kenya. The study employed the descriptive survey design. Data of the study were collected through observation, photography, interview and questionnaires. Data analysis was done using statistical package for social sciences software (SPSS) Version 20. The study found out that the charcoal enterprise activities as practiced in Narok south sub county is unsustainable, and detrimental to environmental sustainability. This led to forest cover reduction and environmental degradation and is a threat to biological diversity in the area which attracts tourists.

Onekon and Kipchirchir (2016) assessed the effect of charcoal production and use on the transition to a green economy in Kenya. The study adopted a research survey design involving the use of semi-structured questionnaire. Descriptive statistical data techniques were used to analyze the field data. The findings revealed that about 1264 hectares and 15174 hectares of forest cover are depleted on monthly and yearly basis respectively. Forest cover depletion is predicted by charcoal consumption. The study also revealed that Kenya would lose about 65.6% of its forest cover to charcoal production and use by 2030.

Aboh and Zhangqi (2016) examined environmental impacts of charcoal and fuelwood consumption in Cote d'Ivoire. The survey research design was employed for the study. Data were obtained via interviews, questionnaires and observations. Data were qualitatively and quantitatively analyzed. A qualitative analysis through the households has showed that charcoal was the fuel most used in households and even the choice of its poor energies mainly socio economic. Moreover, the production and consumption have a negative impact on the health of producers and consumers.

Kadafa, Medugu, Dennis and Medan (2017) investigated the health impact of fuel wood utilization on users, and the possible means of controlling the identified impact on households in Yelwa village, Toto LGA, Nasarawa State, Nigeria. The study adopted survey research design. Data of the study were collected through questionnaire. Obtained data were analysed with descriptive statistics. The study found that fuelwood utilization in the study area is increasing on daily basis as a result of the lack of access to clean and affordable energy. Consequently, poverty, household's size, income level of the dwellers, among others are the drivers of fuel wood utilization in the study area, leading to several health problems.

Olarinde and Olusola (2018) examined socio-economic impacts of charcoal production in Oke-Ogun, Oyo State, Nigeria. Descriptive survey design was adopted for the study. Two Local Government Areas were selected based on the accessibility and the availability of charcoal farmers among ten Local Government Areas. Structured questionnaire was used for data collection. Obtained data were analyzed using descriptive statistics including bar chart, frequency distribution, tables and percentages. It was disclosed that charcoal production was profitable in the study area, though production was carried out mainly during off seasons, when rainfall was minimal and when income of the farmers was at a low state, and in most cases not at all. The farmers now found solace in charcoal productions, which now stands as another source of revenue for them. Both the extent of deforestation and ozone layer depletion in the study area is alarming.

Eniola and Odebode (2018) examined health effects of charcoal production among rural dwellers in the derived savannah agro-ecological zone of Nigeria. The researchers adopted survey design for the study. Data were collected through the use of structured interview schedule and focus group discussion (FGD). Data were analysed using both descriptive and inferential statistics. It was discovered that charcoal production has negative impacts on human and environmental health.

Emedilichi (2018) assessed environmental impact of charcoal production processes in Kaduna State, Nigeria. The survey research design was adopted for the study. Data were collected through interviews, and discussion with charcoal producers. Analyzed data disclosed that there is increase in quantity of production over the years due to high demand of the product, and at the same time more trees are being cut down which contributes to depletion of forests.

Eniola, Odebode and Ayandele (2018) investigated the socio-economic contributions of charcoal production to rural dwellers livelihood in the rainforest zone of Nigeria. Survey design was employed for the study. Data were obtained through the use of structured interview. The data were subjected to descriptive statistics, analysis of variance and regression analysis at $p=0.05$. It was revealed that charcoal production contributed significantly to the economic sustenance of the rural dwellers.

Harindintwari and Ngendahayo (2019) assessed socio-economic and environmental impact of charcoal production in Nyamasheke District of Tanzania. The survey design was employed, data were gathered through in-depth interview with local leaders, and the data were analyzed with both descriptive and inferential statistics. It was revealed that charcoal production has positive economic effects. However, it poses negative effects on the environment. The environment-related impact discovered include loss of forest cover, permanent reduction in the density of the forest, removal of vegetation cover, and thinning of woodlands, among others.

II. METHODOLOGY

Survey research design was adopted for the study. Two hundred respondents were selected by the use of the simple

random sampling technique. Data of the study were collected through Environmental Impact of Charcoal Production Assessment Scale” (EICPAS) which was constructed in a 4-point likert scale format with the following options: Very High Extent (VHE) (4 points), High Extent (HE) (3 points), Low Extent (LE) (2 points), and Very Low Extent (VLE) (1 point). The descriptive statistics of frequency count, mean (\bar{x}) and simple percentage were used for analyzing data and answering the research questions

III. RESULTS

The data of the study are presented as follows:

Table 1: Effect of Charcoal Production on Biodiversity Resources

S/N	Item	VHE	HE	LE	VLE	Mean	Decision
1	Charcoal production causes loss of biodiversity	78	73	21	28	3.01	High Extent
2	Deforestation is accelerated as a result of charcoal production and utilization	69	81	31	19	3.00	High Extent
3	Charcoal production leads to loss of habitats for tree dwelling animals and birds	71	79	32	18	3.02	High Extent
4	Charcoal production disturbs balances in food webs and food chains	61	85	37	17	2.95	High Extent
5	Charcoal production endangers wildlife and sometime leads to their extinction	59	81	37	23	2.88	High Extent
General Mean						2.97	High Extent

Table 1 captured data relating to effect of charcoal production on biodiversity. The entire questionnaire items were agreed. Least weighted mean for the items is 2.88 while the maximum

is 3.02. The general weighted mean for the items is 2.97. This implies that charcoal production has effect on biodiversity resources in Abaji Area Council, Abuja.

Table 2: Effect of Charcoal Production on Physical Environment

S/N	Item	VHE	HE	LE	VLE	Mean	Decision
1	Charcoal production exposes lands to water and wind erosions	63	87	38	12	3.01	High Extent
2	Bush fires as a result of charcoal production depletes soil nutrients	57	79	38	26	2.84	High Extent
3	Production of charcoal causes air pollution	61	77	35	27	2.86	High Extent
4	Charcoal production causes water pollution	58	79	33	30	2.83	High Extent
5	Charcoal production diminishes the aesthetic values of the physical environment	63	79	31	27	2.89	High Extent
General Mean						2.89	High Extent

Table 2 captured data relating to effect of charcoal production on physical environment. The entire questionnaire items were agreed. Least weighted mean for the items is 2.83 while the

maximum is 3.01. The general weighted mean for the items is 2.89. This implies that charcoal production has effect on physical environment in Abaji Area Council, Abuja.

Table 3: Effect of Charcoal Production on Socio-economic Environment

S/N	Item	VHE	HE	LE	VLE	Mean	Decision
1	Charcoal production is important income generating activity	62	83	29	26	2.91	High Extent
2	Charcoal production is caused by endemic poverty among majority of inhabitants	66	75	34	25	2.91	High Extent
3	Charcoal production is as a result of lack of other useful employments	72	79	31	18	3.03	High Extent
4	Charcoal production is mostly carried out by men as a mean of livelihood	69	81	35	15	3.02	High Extent
5	Charcoal is commonly used for cooking and baking by residents and business outlets	57	79	38	26	2.84	High Extent
General Mean						2.94	High Extent

Table 3 captured data relating to effect of charcoal production on socio-economic environment. The entire questionnaire items were agreed. Least weighted mean for the items is 2.91 while the maximum is 3.03. The general weighted mean for

the items is 2.97. This implies that charcoal production has effect on socio-economic environment of Abaji Area Council, Abuja.

Table 4: Effect of Charcoal Production on the Health of Residents

S/N	Item	VHE	HE	LE	VLE	Mean	Decision
1	Charcoal production causes irritations, sinusitis, and dizziness among producers	72	77	38	13	3.04	High Extent
2	Charcoal production causes chest pain and muscular soreness to the producers	69	76	41	14	3.00	High Extent
3	Respiratory diseases and cough are associated with charcoal production and utilization	70	75	39	16	3.00	High Extent
4	Charcoal production causes fatigue to producers	66	77	47	10	3.00	High Extent
5	Charcoal production and utilization causes eye problems, burns, and excessive body heat	59	73	46	22	2.85	High Extent
General Mean						2.98	High Extent

Table 4 captured data relating to effect of charcoal production on health of the residents. The entire questionnaire items were agreed. Least weighted mean for the items is 2.85 while the maximum is 3.04. The general weighted mean for the items is 2.98. This implies that charcoal production has effect on health of residents in Abaji Area Council, Abuja.

IV. DISCUSSION OF FINDINGS

The present study revealed that charcoal production and utilization have impact on the biophysical environment of Abaji Area Council, Abuja. Environmental hazards such as forest depletion, deforestation, loss of biodiversity are associated with production and utilization of charcoal which invariably contributes to increase of CO₂ on the atmosphere.

This finding agrees with the findings of Kokou, Nuto and Atsri (2009) who submitted that charcoal production has negative effect on natural ecosystems as a result of depletion of biodiversity and deforestation in Togo. Anang, Akuriba and Alerigesane (2011) also identified deforestation, diminishing wildlife population, bush fires and nutrient depletion as the most critical environmental effects of charcoal production in Gushegu District of the Northern Region of Ghana. In a similar study, Absolom (2014) found that charcoal production in Narok-South Sub-County in Kenya has led to forest cover

reduction and environmental degradation and is a threat to biological diversity in the area which hitherto attracted many tourists.

Similarly, Onekon and Kipchirchir (2016) revealed depletion and deforestation as a result of charcoal production and use in Kenya. In their respective studies, researchers within and outside Nigeria, in the persons of Olarinde and Olusola (2018), Emeodilichi (2018) and, Harindintwari and Ngendahayo (2019) have all established that environmental effect of charcoal production are alarming. These effects include loss of forest cover, reduction in the density of forests, removal of vegetation cover, and loss of biodiversity, among others.

Abaji Area Council of the FCT, Abuja is known for charcoal production and utilization. Charcoal is commonly used for cooking and baking by residents and business outlets such as restaurants and bakeries. The use of charcoal is associated with poverty and low income jobs earning among residents; and the mass production could also be associated with joblessness among residents as the Area Council is lacking in employment opportunities compared to other Area Councils in the FCT in-terms of development and economic activities. As a result of this, many residents depend on production of charcoal for their livelihood. This implies that production and

utilization of charcoal has socio-economic impact in Abaji Area Council of the FCT, Abuja.

This finding is consistent with the findings of Anang, Akuriba and Alerigesane (2011) who submitted that charcoal production has socio-economic impact on residents, and that it is an important economic activity in Gushegu District of Northern Region of Ghana involving mostly women in search for livelihood. The study of Lurimuah (2011) also revealed that charcoal production is an income generating activity in the Upper West Region of Ghana.

Other studies that agree with the present findings on socio-economic impact of charcoal include those of Absolom (2014), Aboh and Zhangqi (2016), Olarinde and Olusola (2018), Emeodilichi (2018) and, Harindintwari and Ngendahayo (2019) who respectively disclosed that charcoal production is a lucrative business and that it has environmental implications in the regions and countries where they are produced.

In spite of the socio-economic benefits of charcoal production and utilization in Abaji Area Council of the FCT, Abuja, the inhabitants ironically suffer from charcoal related fatigue, and sicknesses. Health challenges such as irritations, chest pains, sinusitis, dizziness, muscular soreness, cough, eye problems, burns, and excessive body heat are common among both producers and consumers of charcoal. These sicknesses could occur as a result of continuous exposure to carbon four oxide during the process of charcoal production.

This finding agrees with the findings of Aboh and Zhangqi (2016) who observed that in spite of the health hazard associated with charcoal, production is still high in Cote d'Ivoire. Kadafa, Medugu, Dennis and Medan (2017) also agreed that charcoal production has health implications which include eye, respiratory, and heart diseases in Yelwa village, Toto LGA of Nasarawa State. Equally, Eniola and Odebode (2018) established health effects of charcoal production among rural dwellers to include among others body irritation, burns, fatigue, and eyes problems.

V. RECOMMENDATIONS

- i. Jobs opportunities should be provided by the Area Council Authorities to residents to combat the menace of poverty which is one of the major factors encouraging charcoal production as means of livelihood.
- ii. Government and non-governmental organizations as well as private investors should explore both natural and human potentials in the Area Council through investment in other valuable businesses as alternatives to charcoal production and utilization.

- iii. Environmentally friendly technology such as fuel-efficient stoves should be provided by the government at affordable prices to the masses as alternative to the unsustainable production and utilization of charcoal in the Area Council.

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