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Full Length Research Paper

Economic distance and cross-country spillovers among African economies: Implication for growth and Development

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This study examines the level of linkage between Nigeria and some selected African countries on one hand and the linkages between economic growth, inflation, and unemployment on the other hand, in these economies. The study covers the period between 2000 and 2019. The study aims to first measure the economic distance between Nigeria and these countries using the approach proposed by Mazurek. Second, the degree of spillovers was characterized between Nigeria and these countries, using a VAR-based spillover index method proposed by Diebold and Yilmaz. The main finding of the study is that the selected African economies are quite economically dispersed, and the level of cross-border spillover is negligible. This would suggest that growth in one economy has not been influenced by the growth in the other economies in the region. Given this, the study recommends that policies that will improve intra-African trade should be formulated. Such policies should incorporate a trade-by-barter-like framework, where Africa can demand what it produces and produce what it demands. Essentially, much more attention should be paid to the supply side of the market than the demand side following the Says law that increasing production will naturally result in proportionate increase in demand. To achieve this, enabling environment should be created to engender technological innovations while improving human and capital infrastructures.

Key words: African, development, economic distance, growth, spillovers.

INTRODUCTION

Empirical studies of economic interdependence among countries started emerging in the early 1990s. Today, most popular discussions on economic growth and development focus on the economic interdependence of nations and generally assume that the economy of one country is not independent of the economies of others (Conley and Ligon, 2002). This argument is in line with an economic theory that also suggests that economic outcomes across countries will not be independent. For instance, Lucas (1990), De Long and Summers (1991), Krugman (1991), and Ciccone (1996) highlighted the importance of technology, human capital, and other forms

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of spillovers. The existence of foreign trade lends empirical support to this claim. The role of international trade is becoming increasingly significant, especially with the unavoidable incidence of globalization. Modern economies are more linked due to merchandise and services trade, flows of money, and foreign investments, making economic relations a critical element of every country, especially in the developing world.

The sustainable development of an economy is essentially linked to international trade and free trade agreements, especially in the era of globalisation. This partly explains the reasons for numerous free trade agreements among countries and regions, in the bid to improve international trade. However, despite the existence of several free trade agreements, Africa is yet to assert itself as a key player in the world economy as shown by its decreasing contributions to global production and trade. The situation of Africa is even aggravated by the fact that intra-continent trade is very low; it is just 12% compared to averages of 61 and 67% of the European Union and Asia-Pacific Economic Co-operation, respectively (AfDB, 2014; Uzodigwe, 2017). The question that comes to mind is: why is intra-African trade still poor considering the huge natural resources at its disposal? Many reasons may be adduced for this, but we are of the view that the content of Africa's export and import baskets are among the major reasons.

First is the level of relative economic distance between African countries. Ghemawat (2001) has emphasized distance as an obstacle to foreign trade. A distance is often referred to the physical distance. In statistical meaning, distance determines the level of dissimilarity between patterns, objects, or units. Therefore the cultural, social, political, geographic, and economic distances can be distinguished. Our focus here is on economic distance defined as the similarity between the domestic and foreign countries in terms of economic systems and metrics (Thai-Ha, 2017). In general, the economic distance identifies a dissimilarity level between national economies. For example, countries are classified as undeveloped (pre-industrial, almost entirely agrarian), developing (underdeveloped industrial base, low living standard), and developed (postindustrial) economies. This could mean dissimilarities in macroeconomic fundamentals such as per capita gross domestic product (GDP), economic growth rates, inflation, unemployment rate, etc. It has been shown that economic distance affects the flows of trade (Linder, 1961; Thai-Ha, 2017). Greater economic distance between trading economies is likely to impede bilateral trade since it suggests heterogeneity in the demand structure. Economies with unrelated demand structures import and export less horizontally differentiated products. Hence, the size of mutual trade decreases with greater economic distance. On the contrary, mutual trade between nations tends to rise when they have more similar per-capita incomes, as a result of homogeneity in demand structure.

Further, efficient allocation of resources is made possible through trade. This can engender growth that might be transformed into higher factor accumulation, mainly for nations interrelated by technology diffusion and knowledge spillovers. Spillover is easily created when there is some level of closeness between/among nations shared. Put differently, any time there is an investment (this arrangement is made possible through trade) in one country by another, both the host nation and its surrounding nations gain from such investment. Accordingly, bilateral trade plays a vital part in the growth of that economy as well as its surrounding regions. This paper, therefore, intends to measure the level of economic distance as well as the degree of cross-border spillovers in Africa using Nigeria and fifteen other countries as reference countries. The study investigates these issues by looking at Nigeria vis-à-vis other countries. Specifically, the sample countries are categorised into; top income, middle income, and bottom income economies using the size of gross domestic product (GDP) as the basis.

The rest of the paper is structured as follows: following the introduction in section one is a brief review of a few related studies in section two, section three provides the analytical framework and model specification, and section four dwells on the data analysis and discussion of results and section five concludes with recommendations.

LITERATURE REVIEW

Theoretical literature

The theoretical underpinning for this study is the neoclassical theory of economic externality initially developed by Alfred Marshall in 1890. The theory posits that in a capitalist economy, economic agents do not internalize all the costs occasioned by their economic actions. The theory mirrors the spillover effect of economic activities. In the neoclassical context, the externality of the market economy occasions market failure. In other words, the forces of demand and supply cannot efficiently regulate the resources; hence resource allocation is not Pareto-optimum. When the economic agents participate in relevant economic activities, there is always a certain spillover of economic benefits, while the beneficiaries of indirect economic benefits do not need to pay fees, which makes the economic effects low. On the other hand, when the economic activities of the parties show negative externalities, that is, the economic activities cause economic losses to others, the parties are not required to compensate for the losses.

Eventually, this leads to inefficient economic efficiency (Malin et al., 2020). The neoclassical analysis of externality focuses on individual firms trying to maximize profits.

This context focus on open economies that constitute

themselves into Economic and Monetary Unions (EMUs), as it is currently obtained in most regions of the world. In this context, it is important to note that the existence of spillovers by itself is not evidence of a market failure. That is, it may not be possible, via fiscal coordination or some other policy intervention, to provide a Pareto improvement, that is, to make some people better off without making anyone worse off. Two reasons informed our choice of economic externality theory. First, spillovers reflect some level of externalities, whether positive or negative. This suggests that in the open economy, especially in regions where there is some level of economic interaction, what happens in one economy may affect other economies. Second, the existence of cross-country spillovers may imply that there is some level of closeness (economic distance) between and among economies.

Empirical literature

Modern economies are more connected due to several reasons which include, merchandise and services trade, flows of money, and foreign investments. This has made economic relationships a major component of every country, particularly the developing economies.

Some studies have discussed rising globalization, with greater links and similarities between individual states, based on political, economic, and technological phenomena. The use of technology has “flattened” the market, therefore, the directions of trade can be explained by all factors, but the geographic position of a specific economy is relative.

Nevertheless, some scholars contend with this position; Ghemawat (2001), for example, highlights distance as one hindrance to external trade.

In recent times, environmental aspects of international trade have been accorded a prominent place. For example, Boisso and Ferrantino (1997) examined the role of economic distance, cultural distance, and openness in international trade. The researchers estimated annual gravity equations covering the period of 1960-1985 on a large sample, allowing them to identify time trends in the coefficients. The study found among other things that the restrictive effect of economic and cultural distance on international trade increased until the early- to mid-1970s and then began to decline. Also, faster economic growth is associated with greater imports, with increasing intensity over time. Lower tariffs and export taxes are also associated with greater imports, while the effect of free trade groupings is more complex.

Wang et al. (2018) contend that globalization encourages industrial division and creates a large stream of products between nations, leading to severe environmental problems. Looking at the nexus between green logistics and external trade, the authors demonstrated that the logistics performance indexes(LPI) of exporting and importing nations are positively correlated with trade volumes and that the LPIs of exporting nations positively affect the probability of trade.

Ho et al. (2013) studied the nexus between geographic distance and trade, taking into account spatial influence. The paper measured these effects only through the convergence of dynamic panel data and not the effect of spillovers. They found that a significant element that affects using one region over the other is the extent of physical distance between these regions. Similarly, Amidi and Majidi (2020) examined economic growth in terms of ‘bilateral trade flow’ and ‘geographical distance’ using the spatial dynamic panel data model for the period 1992–2016. The findings revealed that the effect of spatial spillover or spatial dependence is one of the main economic growth determinants. Also, the authors found that spatial relationships across countries and the spatial effects of trade are quite relevant. A country’s economic growth is affected by the performance of its neighbours and trade partners. This result suggests that the spillover effects of geographical position and trade partners are the key determinants of economic growth.

On methodology, Antonakakis and Badinger (2012) examined the linkages between output growth and output volatility in the G7 countries over the period 1958M2–2013M8 using the VAR-based spillover index approach by Diebold and Yilmaz (2012). The author found that output growth and volatility are highly intertwined. Generalized impulse response analyses suggest moderate growth spillovers and sizable volatility spillovers across countries. A similar method was employed by Udeaja (2019) in examining the intensity of connected-ness among the Nigerian financial markets for the period January 2000 to December 2018. The study used all shares index, Treasury bill rate, and Naira/USD official exchange rate to measure the stock market, money market, and exchange rate market, respectively. The study found connectedness among the Nigerian financial markets to be highly time-varying and appear to be higher during the period of high depreciation of the naira which coincides with the period of falling oil prices and the domestic economic meltdown of 2014 and 2016, respectively.

MATERIALS AND METHODS

Data

The study made use of a dataset covering the periods between 2000 and 2019. The variables studied include output growth rates, inflation rate, and unemployment rate, and they were sourced from the World Bank Development Indicator (WBDI) and the respective country’s Central Bank.

Theoretical framework

Most extant studies analyzed cross-country spillovers using the VAR approach, advanced by Koop et al. (1996) and Pesaran and Shin (1998) as a theoretical framework, and one such study is by

Salisu et al. (2018). However, in recent times, many studies have adopted the framework proposed by Diebold and Yilmaz (2009, 2012, 2014). Owing to its novelty and strength, the Diebold –Yilmaz (DY) methodology is commonly used to characterize spillovers. Contrary to the orthodox VAR, the DY methodology uses decomposition of forecast error variance from VAR and it is fit for the assessment of the level of interdependence among nations across different economies and within an economy. Many spillovers can be produced using the DY method, such as; Total-Spillovers, Directional-Spillovers, and Net-Pairwise-Spillovers (Udeaja, 2019, Antonakakis and Badinger, 2015).

Model specification

Following Mazurek (2012), some measures of economic distance was outlined. Specifically, the relative economic distance was evaluated as well as the group relative distance between/among the countries of interest as follows:

Definition 1: Suppose we have two countries, *X* and *Y*, and the variable of interest *f*. The period is given by *γ* and *r* is the Pearson's correlation coefficient of time series f_x and f_y for the time *γ*. Therefore, our relative economic distance (RED) between *X* and *Y* (where X and Y are the two countries we are considering) in the indicator *f* for the time *γ* is defined by:

$$RED_{f,\gamma}(X,Y) = \{\frac{1-r(fx,\ fy)}{2}\} * 100 \quad (1)$$

The RED presented in equation 1 has the following properties:
$RED_{f,r}$ (A,B) ∈ (0, 100)%.

If the coefficient of correlation *r* of the two series, f_X and $f_{Y,}$ *is* unity, then $RED_{f,t}$ (*X,Y*) = 0 %.

If the coefficient of correlation *r* of the two series, f_X and $f_{Y,}$ *is* zero, then *REDf,t* (*X,Y*) = 50 %.

If a correlation coefficient of time series f_X and f_Y *r* = –1, then *REDf,t* (*X,Y*) = 100 %.

The relative economic distance presented in equation 1 can also be extended in analyzing–group relative economic distance, which expresses the degree of 'economic globalization' among a group of economies (Mazurek, 2012).

Definition 2: Suppose further that *Z* is a list of economies such that *Z* = {Z_1, Z_2, Z_3…….. Zn} and $RED_{i,j}$ represents the relative economic distance between two nations *i* and *j* using a given ~~in~~ macroeconomic index *f* for a time *γ*. Accordingly, the group RED for this list of countries *Z* is defined by:

$$GRED_{f,r}(Z) = \frac{\sum_{i=1, i>j}^{n} RED_{ij}}{\binom{n}{2}} \quad (2)$$

Therefore, a Group RED is simply an estimation of the arithmetic mean of all the REDs among different economies in the group. Again, $GRED_{f,\gamma}$ (Z) ϵ [0, 100] % and greater values of Group RED mean a greater mean level of economic closeness within a group (Mazurek, 2012).

Two important questions arise from the definitions; namely (1) How suitable is RED for the evaluation of the relative economic distance? (2) Which macroeconomic indicator should be used for the evaluation? The answer to the first question can be provided by cointegration analysis. Hence, we test for cointegration among the variables in the groups to make sure that RED is suitable for the evaluation of economic distance. To address the second question, Mazurek (2012) maintains that the growth rate of GDP is an appropriate indicator for evaluating how close economies are.

However, other microeconomics fundamentals such as unemployment rates or inflation can also be used. In this paper, monthly and quarterly time series of GDP growth rates, inflation rates, and unemployment rates spanning from 2000:1 to 2019:4 are used.

Next, the author look at the spillover index using the DY framework. Drawing from a 1980 seminal paper by Sims and building on the popular idea of variance decompositions. The DY framework helps to assess the contributions of shocks to variables to the forecast error variances of both the respective and the other variables of the model (Antonakakis and Badinger, 2015). In this paper, the version of the connectedness index in Diebold and Yilmaz (2012, 2014) was adopted.

This version improves and takes a broader view of the approach proposed in Diebold and Yilmaz (2009). There are two major areas of improvement. Firstly, stronger procedures of directional spillovers and net spillovers were introduced, generating an 'input-output' disaggregation of the entire spillovers into the ones emanating from (or to) a specific source (variable) and giving the room to detect the major receivers and transmitters of spillovers (Antonakakis and Badinger, 2015). Secondly, following some other VAR-based studies, for example, Pesaran and Shin (1998), the DY framework employed a generalized VAR framework, where forecast-error variance decompositions do not change following the re-ordering of the variables, different from the Cholesky-factor identification adopted in Diebold and Yilmaz (2009).

Aligning with the DY framework and following Antonakakis and Badinger (2015), we set up directional spillover indexes in a generalized VAR framework that is invariant to the variable (Antonakakis and Badinger, 2015). In setting up the spillover indexes, a covariance stationary N variable VAR (p) of the following form is considered.

$$Z_t = \sum_{j=1}^{q} \Phi_j Z_{t-1} + \varepsilon_t \quad (3)$$

Where Z_t = (Z_{1t}, Z_{2t}, Z_{3t}, Z_{4t}, Z_{5t},……., Z_{Kt}) is a vector of K endogenous variables, Φj, j= 1,…, q are K x K parameter matrices and εt ~ (0,Σ) is a vector of error terms, which are assumed to be well behaved; t =1, …, T is the time index and k =1,…, K is the macroeconomic fundamental for each of the sixteen economies we are studying, namely; Nigeria (NIG), South Africa (RSA), Egypt (EGY), Algeria (ALG), Morocco (MOR), Kenya (KEN), Burkina Faso (BKF), Mauritius (MAU), Namibia (NAM), Madagascar (MAD), Guinea (GUI), The Gambia (GAM), Seychelles (SEY), Guinea Bissau (GUB), Comoros (COM) and Sao Tome and Principe (STP). The VAR equation in 3 has observations on GDP growth (grXt), inflation rate (infXt) and unemployment rate (unXt) (Xt, x =1, 2, 3, 4, 5, 6, …,16), with X representing a country index. Therefore, given the sixteen selected economies and three macroeconomic indicators (GDP growth rate, inflation rate and unemployment rate), the model consists of K = 48 indicators, that is, Zt = (grXt, infXt, unXt) where grXt, infXt and unXt are 16 × 1 vectors with observation on GDP growth, inflation rate and unemployment rate for the 16 countries in that order.

Key to the dynamics of the system is the moving average representation of model (3), therefore, re-specifying equation (3) as a moving average gives:

$$Y_t = \sum_{j=0}^{\infty} \mathrm{A}_j \varepsilon_{t-j} \quad (4)$$

A_j is said to obey the recursion $\mathrm{A}_j = \varphi_1 \mathrm{A}_{j-1} + \varphi_2 \mathrm{A}_{j-2} + \varphi_3 \mathrm{A}_{j-3}$

$+ \varphi_3 A_{j-4} + \ldots + \varphi_p A_{j-p}$, A_0 is the K x K identity matrix and $A_j = 0$ for j < 0. Equation (4) is the basis for the derivation of variance decompositions. Hence, the procedure for providing the representations for the various indexes started with the H-step ahead forecast error variance decomposition.

$$Q_{ij}(H) = \frac{\sigma_{jj}^{-1} \sum_{h=0}^{H-1} (e_i' A_h \sum e_j)^2}{\sum_{h=0}^{H-1} (e_i' A_h \sum A_h' e_j)} \quad (5)$$

The sigma (Σ) represents expected variance matrix of the error vector *ε,* while *σjj* denotes the expected standard deviation of the disturbance term for the *j-th* element. The term *ei* is the choice error. From equation (5), we obtain a K × K matrix $_Q(H) = [_Q ij(H)]i,j = 1,...12$. Each of the entries in equation (5) provides the contribution of variable j to the forecast error variance of variable i. The elements in the major diagonal depict the (own) contributions of shocks to the variable i to its own forecast error variance, the off-diagonal elements show the (cross) contributions of the other variables j to the forecast error variance of variable i. Given that $\Sigma^k_j = {}_{1Q}ij(H) \neq 1$, (that is, the sum of the contribution shares is not equal to one) each entry of the variance decomposition matrix is normalized by its row sum. Thus, the normalized KPPS H-step-ahead forecast error variance decomposition is:

$$\overline{Q}_{ij}(H) = \frac{Q_{ij}(H)}{\sum_{j=1}^{k} Q_{ij}(H)} \quad (6)$$

$\sum_{j=1}^{k} \bar{Q}ij\,(H) = 1$ while $\sum_{i.j=1}^{k} \bar{Q}ij\,(H) = K$. With equation (6), it can calculate the total spillover index. This is shown in Equation (7):

$$S(H) = \frac{\sum_{i.j=1,i}^{k} \overline{Q}_{ij}(H)}{\sum_{i.j=1}^{k} \overline{Q}_{ij}(H)} * 100 = \frac{\sum_{i.j=1,i\neq j}^{k} \overline{Q}_{ij}(H)}{K} * 100 \quad (7)$$

Equation (7) defines the average contribution of spillovers from shocks to all (other) variables to the total forecast error variance. By looking at the directional spillovers, the directional spillovers received by variable *i* from all other variables j can be seen. This is expressed in the equation below.

$$S_{i\leftarrow j}(H) = \frac{\sum_{j=1,i\neq j}^{k} \overline{Q}_{ij}(H)}{\sum_{i.j=1}^{k} \overline{Q}_{ij}(H)} * 100 = \frac{\sum_{j=1,i\neq j}^{k} \overline{Q}_{ij}(H)}{K} * 100 \quad (8)$$

Similarly, the directional spillovers from variable *i* to all other variables j is given by:

$$S_{i\rightarrow j}(H) = \frac{\sum_{j=1,i\neq j}^{k} \overline{Q}_{ji}(H)}{\sum_{i.j=1}^{k} \overline{Q}_{ji}(H)} * 100 = \frac{\sum_{j=1,i\neq j}^{k} \overline{Q}_{ji}(H)}{K} * 100 \quad (9)$$

The directional spillovers provide a decomposition of total spillovers into those coming from (or to) a particular source. Accordingly, the spillover matrix is made up of four blocks, namely; the two main diagonal blocks (i, j from 1 up to 6 on one hand and i, j from 7 up to 12 on the other hand) indicating variable X to variable X spillover and variable Y to variable Y spillovers; and the off-diagonal blocks (i is from 1 up to 6 and j is from 7 up to 12 and i is from 7 up to 12, j is from 1 up to 6), indicating variable X to variable Y spillover and variable Y to variable X spillovers, where X and Y are the variables under consideration, in this present case we have; GDP growth and Inflation, GDP growth and unemployment and inflation and unemployment.

Estimation procedure

The author begins the empirical investigation by first, providing the summary statistics of variables of interest. After testing for stationarity using ADF test statistics, he employed the Pearson Correlation to test for the degree of association between the indicators. He also tested for group cointegration using the Pedroni Panel Cointegration approach. Further, the results of the unconditional correlation are then used to evaluate both the relative and group economic distance. And finally, the level of connectedness was examined among countries of interest using Diebold and Yilmaz's (2009, 2012, 2014) spillover indices.

RESULTS AND DISCUSSION

Preliminary analysis

Before the estimation, summary statistics (Table 1) of the variables for each of the selected countries was provided. The results are shown in Table 1 in three panels. Panel A show the summary statistics for Nigeria and the next top five economies in Africa.

Panel B shows the summary statistics for the middle and bottom five economies in Africa respectively. Note that we have included Nigeria in all the categories because Nigeria is the basis for comparison. The mean value indicated that the three indicators in each of the sixteen countries have a positive mean value over the period. The quarterly average growth rate was highest in Nigeria (6.20), followed by Burkina Faso (5.69) and then Sao Tome and Principe (4.85). On the other hand, countries with the least mean growth in output during these periods were Comoros (2.64), followed by South Africa (3.2), and then Seychelles (3.2). The country with the highest average inflation rate during these periods was Guinea (14.3), followed by Nigeria (11.33) and then Egypt (10.65). Conversely, inflation rates were lowest in Morocco (0.78), followed by Burkina Faso (2.08) and Comoros (3.08). The quarterly average unemployment was highest in South Africa (25.02) followed by Namibia (21.36) and Algeria (14.63). On the other hand, countries with the least mean unemployment during these periods were; Madagascar (2.8), followed by Seychelles (3.31), and then Burkina Faso (4.55). The sizes of the standard deviation indicate that economic growth and inflation exhibit large variability, especially in countries like Nigeria, Madagascar, Seychelles, Guinea, Algeria, Guinea Bissau, etc., on the other, variability in unemployment is generally small. Finally, the unit root results of the Augmented Dickey-Fuller (ADF) show that all the indicators for each of the countries are stationary

Table 1. Descriptive statistics of output growth, inflation, and unemployment.

Panel A: Nigeria and the next five top income economies in Africa																		
	grNIG*	**grRSA**	**grEGY**	**grALG**	**grMOR**	**GrKEN**	**infNIG***	**infRSA**	**infEGY**	**infALG**	**infMOR**	**infKEN**	**unNIG***	**unRSA**	**unEGY**	**unALG**	**unMOR**	**unKEN**
MEAN	6.20	2.67	4.34	3.32	4.11	4.72	11.33	6.70	10.65	6.51	0.78	7.58	4.86	25.02	11.0	14.67	10.08	10.96
Std	6.91	1.81	1.59	1.57	1.66	2.17	10.69	1.84	5.46	8.48	2.11	5.10	1.43	1.74	1.50	6.41	1.32	0.86
N	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
ADF	-6.7**	-8.7**	-8.7**	-7.1**	-10.0**	-8.7**	-7.2**	-8.7**	-8.7**	-6.9**	-5.9**	-8.0**	-5.3**	-8.8**	-8.7**	-9.2**	-3.2**	-8.7**
Panel B: Nigeria and five middle income economies in Africa																		
	grNIG*	**grBKF**	**grMAU**	**grNAM**	**grMAD**	**GrGUI**	**infNIG***	**infBKF**	**infMAU**	**infNAM**	**infMAD**	**infGUI**	**unNIG***	**unBKF**	**unMAU**	**unNAM**	**unMAD**	**unGUI**
MEAN		5.69	4.24	3.86	3.16	4.61		2.08	3.75	6.95	8.73	14.30		4.55	7.61	21.36	2.80	4.52
Std		1.62	1.86	3.47	4.56	3.05		3.20	2.85	3.61	3.62	21.0		1.52	0.95	1.79	1.47	0.08
N		80	80	80	80	80		80	80	80	80	80		80	80	80	80	80
ADF		-10.**	-8.3**	-6.8**	-8.1**	-8.7**		-8.7**	-8.7**	-8.7**	-8.7**	-6.8**		-9.0**	-8.7**	-8.7**	-8.9**	-8.8**
Panel C: Nigeria and five bottom income economies in Africa																		
	grNIG*	**grGAM**	**grSEY**	**grGUB**	**grCOM**	**GrSTP**	**infNIG***	**infGAM**	**infSEY**	**infGUB**	**infCOM**	**infSTP**	**unNIG***	**unGAM**	**unSEY**	**unGUB**	**unCOM**	**unSTP**
MEAN		3.71	3.20	3.28	2.64	4.85		6.06	7.25	7.04	3.08	10.49		9.37	3.31	5.96	4.88	14.80
Std		3.44	4.38	2.48	0.82	1.97		3.74	9.92	17.83	2.59	6.73		0.11	0.85	1.18	1.21	1.40
N		80	80	80	80	80		80	80	80	80	80		80	80	80	80	80
ADF		-7.3**	-8.7**	-6.8**	-8.8**	-5.5**		-8.7**	-8.7**	-5.2**	-8.7**	-7.5**		-8.8**	-8.7**	-8.8**	-8.8**	-3.9**

Means and standard deviations are expressed in % point. ADF denotes augmented Dickey Fuller tests with 5% critical values of −2.9029.* We included Nigeria in each of the categories in order to evaluate the correlation between Nigeria's indicators and those of other countries ** Significant at 5% level.
Source: The authors' computation.

at first difference.

Unconditional correlation matrix

The unconditional correlations result carried out on the percentage rate (%) of GDP growth, inflation, and unemployment for Nigeria and the rest of the fifteen countries is presented in Table 2.

Specifically, the correlation between Nigerian indicators and those of other countries was examined. In Summary, the result shows that economic growth in Nigeria exhibits positive correlation with economic growth in nine of the countries, except for Kenya, Burkina Faso, Guinea, Seychelles, Guinea Bissau, and Comoros where evidence of a negative correlation between Nigeria's economic growth and each of the country's growth was found. The result also reveals that there is a positive correlation between economic growth in Nigeria and inflation in the vast majority of the countries (South Africa, Algeria, Morocco Kenya, Mauritius, Madagascar, Guinea, The Gambia, Seychelles, Comoros, and Sao Tome and Principe). Economic growth in Nigeria exhibits a negative correlation with Inflation in the rest of the countries (including Nigeria). On the relationship between economic growth in Nigeria and unemployment in other economies, as expected, the result indicates a negative correlation between Nigeria's economic growth and unemployment in Nigeria, South Africa, Egypt, Kenya, Burkina Faso, and Comoros. On the other hand, we find a positive correlation exists between Nigeria's economic growth and unemployment in the rest of the economies (Algeria, Morocco, Mauritius, Namibia, Madagascar, Guinea, The Gambia, Seychelles, Guinea Bissau, and Sao Tome and Principe. Table 3 presents information on the correlation between Nigeria's inflation and others' indicators

Table 2. Unconditional correlation.

Nigeria and top income economies				Nigeria and middle income economies				Nigeria and bottom income economies			
Country	**grNIG**	**infNIG**	**unNIG**		**grNIG**	**infNIG**	**unNIG**		**grNIG**	**infNIG**	**unNIG**
grNIG	1			grNIG	1	-0.268	-0.332	grNIG	1	-0.268	-0.332
grRSA	0.372	0.394	-0.466	grBKF	-0.176	-0.126	0.174	grGAM	0.278	-0.425	0.158
grEGY	0.011	0.017	0.207	grMAU	0.301	0.172	-0.126	grSEY	-0.365	0.146	0.048
grALG	0.247	0.345	-0.44	grNAM	0.546	0.053	-0.616	grGUB	-0.178	-0.079	0.158
grMOR	0.295	-0.301	-0.431	grMAD	0.139	-0.376	0.157	grCOM	-0.085	0.535	0.007
grKEN	-0.004	-0.408	0.174	grGUI	-0.436	0.059	0.582	grSTP	0.069	0.116	-0.277
infNIG	-0.268	1	0.019	infNIG	-0.268	1	0.019	infNIG	-0.268	1	0.019
infRSA	0.048	0.45	-0.391	infBKF	-0.129	0.054	-0.191	infGAM	0.586	-0.088	0.198
infEGY	-0.06	-0.307	0.437	infMAU	0.313	0.112	-0.268	infSEY	0.475	-0.382	-0.278
infALG	0.229	0.438	-0.185	infNAM	-0.35	0.301	-0.169	infGUB	-0.124	0.508	-0.089
infMOR	0.147	-0.06	-0.273	infMAD	0.286	0.362	-0.153	infCOM	0.029	-0.466	0.007
infKEN	0.106	-0.166	-0.259	infGUI	0.149	0.133	-0.011	infSTP	0.167	0.207	-0.417
unNIG	-0.332	0.019	1	unNIG	-0.332	0.019	1	unNIG	-0.332	0.019	1
unRSA	-0.238	0.1	0.692	unBKF	-0.394	-0.313	0.493	unGAM	0.166	-0.082	-0.708
unEGY	-0.227	-0.126	0.166	unMAU	0.301	-0.222	-0.469	unSEY	0.096	-0.073	-0.283
unALG	0.172	0.481	-0.176	unNAM	0.008	-0.036	0.524	unGUB	0.24	0.03	-0.808
unMOR	0.192	0.463	-0.226	unMAD	0.24	0.358	-0.291	unCOM	-0.17	0.035	0.759
unKEN	-0.069	-0.352	-0.505	unGUI	0.308	0.009	-0.859	unSTP	0.394	0.293	-0.450

Source: The authors' computation.

Table 3. Summary of pedroni panel cointegration test.

Alternative hypothesis: common AR coefs. (within-dimension)				
			Weighted	
	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	3.586899	0.0002	-0.545788	0.7074
Panel rho-Statistic	-4.296234	0.0000	-3.755383	0.0001
Panel PP-Statistic	-8.083400	0.0000	-8.944788	0.0000
Panel ADF-Statistic	-2.928594	0.0017	-4.562470	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	**Prob.**		
Group rho-Statistic	-2.863701	0.0021		
Group PP-Statistic	-12.47019	0.0000		
Group ADF-Statistic	-3.390374	0.0003		

Source: The authors' computation.

(output growth, inflation, and unemployment) as well as the correlation between Nigeria's unemployment and other's indicators. Generally, the evidence is mixed; there is a positive as well as a negative correlation between these variables across countries. It is, however, important to note that these results are not statistically significant at a 5% level of significance.

Further, the existence of a long-run relationship among the variables using Pedroni Panel Cointegration was tested. The results are presented in Table 3. The result indicates that the variables are cointegrated. This justifies our choice of relative economic distance in evaluating the level of proximate between/among the selected countries.

Economic distance

We begin the discussion by looking at relative economic distance (RED in %) for the fifteen (15) countries in Africa vis-à-vis Nigeria. It made use of the quarterly growth rate

Table 4. Relative economic distance between Nigeria and selected African countries.

	Country	GDP Growth		Inflation rate		Unemployment rate		Average RED (%)
		Pearson's R	RED (%)	Pearson's R	RED (%)	Pearson's R	RED (%)	
Top five economies	South Africa	0.372	31.4	0.450	27.5	0.692	15.4	24.8
	Egypt	0.011	49.45	-0.307	65.4	0.166	41.7	52.2
	Algeria	0.247	37.65	0.438	28.1	-0.176	58.8	41.5
	Morocco	0.295	35.25	-0.060	53	-0.226	61.3	49.9
	Kenya	-0.004	50.2	-0.166	58.3	-0.505	75.25	61.3
Middle five economies	Burkina-Faso	-0.176	58.8	0.054	47.3	0.493	25.35	43.8
	Mauritius	0.301	34.95	0.112	44.4	-0.469	73.45	50.9
	Namibia	0.546	22.7	0.301	35	0.524	23.8	27.2
	Madagascar	0.139	43.05	0.362	31.9	-0.291	64.55	46.5
	Guinea	-0.436	71.8	0.133	43.4	-0.859	92.95	69.4
Bottom five economies	The Gambia	0.278	36.1	-0.088	54.4	-0.708	85.4	58.6
	Seychelles	-0.365	68.25	-0.382	69.1	-0.283	64.15	67.2
	Guinea-Bissau	-0.178	58.9	0.508	24.6	-0.808	90.4	58
	Comoros	-0.085	54.25	-0.466	73.3	0.759	12.05	46.6
	Sao Tome and Principe	0.069	46.55	0.207	39.7	-0.450	72.5	52.9

Source: The authors' computation.

of GDP (expressed in %) was used, inflation rate (expressed in %), and unemployment rate (expressed in %) from 2000 to 2019 to measure the RED in Africa. The results are shown in Table 4.

Relative Economic Distance (RED)

Table 4 shows the relative economic distance between Nigeria and each of the fifteen countries, using three indicators (Economic growth, inflation rate, and unemployment rate). When evaluated using quarterly GDP growth, the South African economy is the closest economy to Nigeria, followed by the Moroccan economy and the Algerian economy.

Among the top five economies, the Kenyan economy is the farthest from the Nigerian economy. Of the middle five economies, the Namibian economy is the closest to the Nigerian economy, while Mauritius ranks second within that category. Similarly, The Gambia from the bottom five category is the closest to the Nigerian economy, while the Seychelles economy is the farthest from the Nigeria economy. Using the average relative economic distance and generally speaking, the South African economy is the closest to the Nigerian economy. This outcome appears to be expected, given that the relationship that exists between Nigeria and South Africa appears to be robust.

The rest of the results are summarised in Figure 1.

Group Relative Economic Distance (GRED)

A group relative economic distance was evaluated among each of the three categories, to examine the level of globalisation among the groups. The result indicates that the level of globalisation, though generally low is higher among the top-income economies in Africa (Figure 2). This may be because cooperation appears to be higher among the top-income economies in Africa.

Spillover indices

Having examined the degree of economic distance between Nigeria and selected economies in Africa, the level of connectedness and spillovers

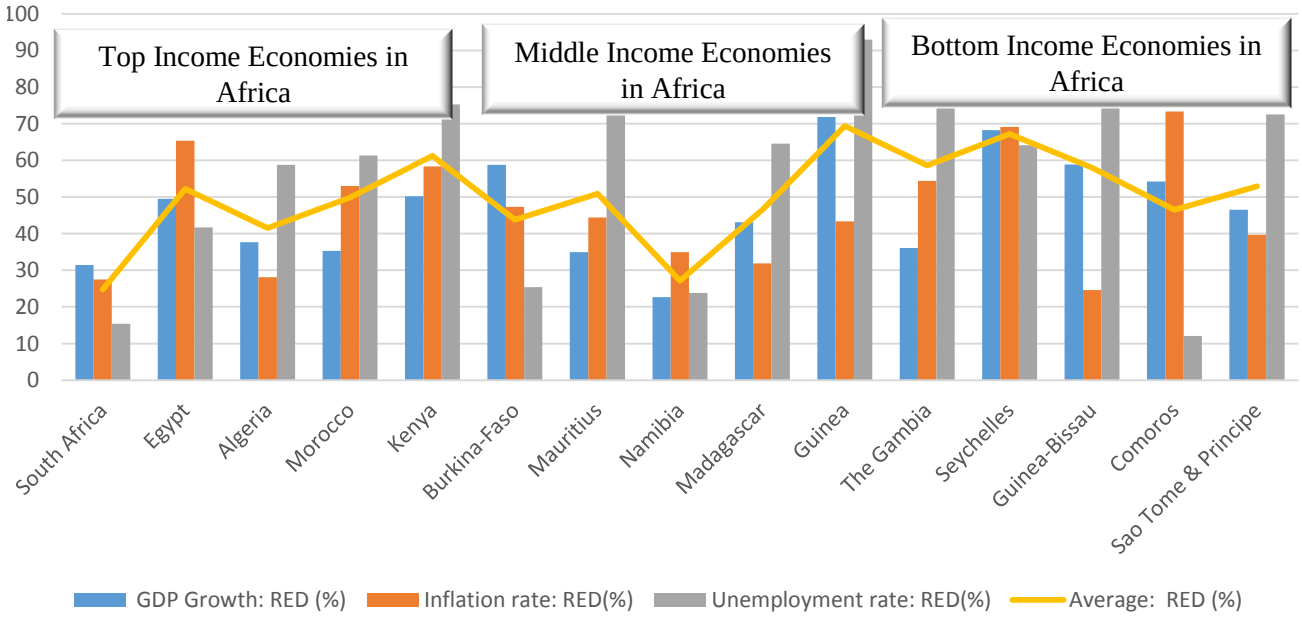

Figure 1. Relative economic distance between Nigeria and selected African countries
Source: The authors' computation.

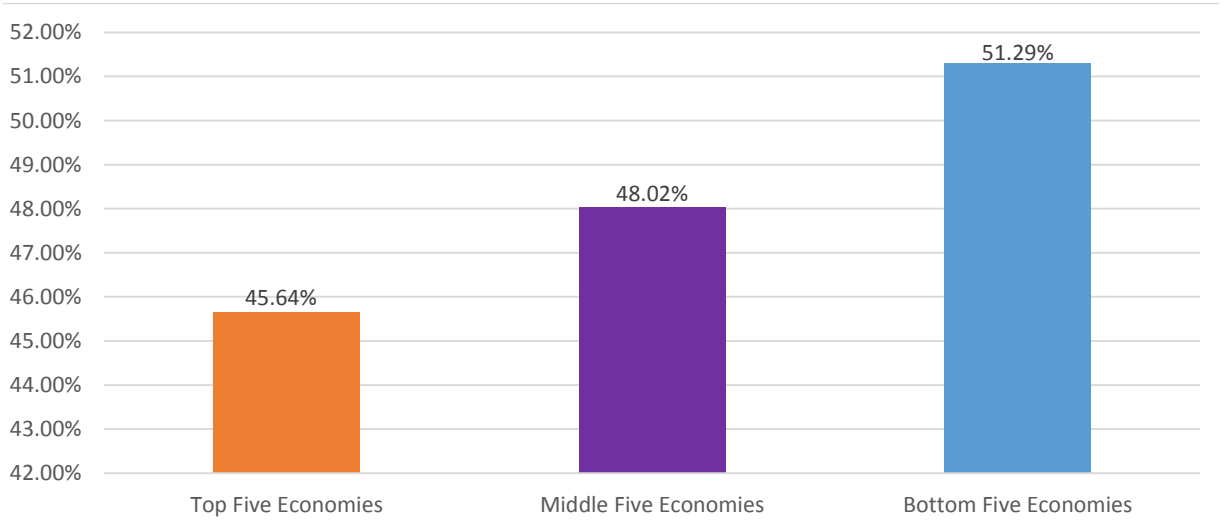

Figure 2. Group Relative Economic Distance (GRED) of the selected African countries.
Source: The authors' computation.

between/among these economies was further investigated. Specifically, the connectedness between a pair of variables was examined (that is economic growth versus inflation, economic growth versus unemployment, and inflation versus unemployment) for each of the three categories (Top, Middle, and Bottom income economies). Before our discussion, the elements in the Tables are first described in Tables (Tables 5a to 7c).

In Panel A of the Tables, the ijth item represents the calculated share of the forecast error variance of an indicator *i* emanating from innovations to indicator j (Equ. 3.5). In the passing, it is important to bear in mind that each variable is linked with one of the economies' indicators (GDP growth, inflation or unemployment). The elements on the diagonal (i = j) account for own-variable spillovers (that is, growth-to-growth, inflation-to-inflation,

Table 5a. Spillover table for the full connectedness of economic growth and inflation In Nigeria and some top income economies in Africa.

To i	*From j*grNIG	grRSA	grEGY	grALG	grMOR	grKEN	infNIG	infRSA	infEGY	infALG	infMOR	infKEN	From others
Panel A													
grNIG	64.1	0.4	1.5	8.9	2.6	0.7	10.2	0.7	9.2	0.2	0.1	1.4	35.9
grRSA	1.6	51.6	4.3	1.2	0.1	6.1	7.8	1	0.1	24.8	0.2	1.2	48.4
grEGY	1.3	5.7	72.5	1.3	0	0.9	0.9	2.6	2.6	4.1	3.9	4	27.5
grALG	6.9	1.2	5.3	46.6	11.6	0	6.5	1.5	1.6	2.1	1.5	15.3	53.4
grMOR	0.8	0.7	0.2	11.7	53.8	0.4	9.7	10.8	0.1	0.7	1.4	9.9	46.2
grKEN	2.3	1.9	1	0.1	1.1	63.4	9.3	14.4	1.4	1.2	0.4	3.6	36.6
infNIG	6.5	9.6	0.4	5.6	8.8	4.7	41.5	12.1	0.7	9	0.1	0.9	58.5
infRSA	0.4	3	1	0.5	8	6.7	11.9	60.5	4.9	0.1	1.6	1.4	39.5
infEGY	5.9	0.1	0.2	0.5	0	1.4	0.5	1.9	71.2	1.2	16.9	0.2	28.8
infALG	0.7	28.9	5.2	4	1.2	0.8	10.8	0	0.7	47.3	0	0.5	52.7
infMOR	0.1	1.9	9.7	1.7	1.1	0.9	0.1	1.1	11.2	0	71.7	0.6	28.3
infKEN	0.7	1.1	5.2	12.2	10.9	4.4	0.2	2.4	0.2	0.9	1.2	60.5	39.5
Contribution to others	27.2	54.5	33.9	47.7	45.5	27	67.9	48.6	32.7	44.3	27.2	38.9	495.3
Contribution including own	91.3	106.1	106.4	94.3	99.3	90.4	109.4	109.1	103.9	91.5	98.8	99.5	TSPI (%) = 41.30%
Panel B													
Contr. to others' gr	12.9	9.9	12.3	23.2	15.4	8.1							81.8 (17.96%)
Contr. to others' inf	7.8	41.6	21.5	20.5	28.9	14.5							134.8 (29.60%)
Contr. to others' gr							34.2	30	12.4	31	6.1	31.8	145.5 (31.95%)
Contr. to others' inf							23.5	17.5	17.7	11.2	19.8	3.6	93.3 (20.49%)

Source: The authors' computation.

And unemployment-to-unemployment) within economies, on the other hand, the off-diagonal elements (i ≠ j) account for the cross-variable spillovers within and between economies. Also, the row sums without the major diagonal elements classified as 'Contributions from others' (Equation 8) and the column sums classified as 'Contributions to others', (Equation 9) show the aggregate contagions 'to' (received by) and 'from' (transmitted by) each indicator. The aggregate spillover index expressed in Equation (7), shown in the lower right corner of panel A in Tables 5a – 7c, is nearly equal to the grand off-diagonal column sum (or row sum) relative to the grand column sum plus the diagonals (or row sum plus diagonals), stated in percentage points.

Nigeria and the next top five income economies in Africa

Economic growth rate and Inflation rate: Table 5a shows the level of connectedness/spillover between the economic growth rate and inflation rate in Nigeria and the next Five Top Income economies in Africa. The diagonal elements account for the growth-to-growth and inflation-to-inflation spillovers within economies, on one hand. On the other hand, the off-diagonal elements measure cross-variable spillovers within and between economies. The result indicates that GDP growth-to- GDP growth spillovers within countries are large in most of the countries,

Table 5b. Spillover table for the full connectedness of economic growth and unemployment in Nigeria and some top income economies in Africa.

To i	*From j* grNIG	grRSA	grEGY	grALG	grMOR	grKEN	unNIG	unRSA	unEGY	unALG	unMOR	unKEN	From others
Panel A													
grNIG	68.3	0.3	1.1	10.2	2.5	1.2	0.8	2.8	2.7	3.6	6.4	0.1	31.7
grRSA	1.7	62.1	5.3	2.4	0.1	14.1	1.4	2.3	6.8	0	0.1	3.8	37.9
grEGY	0.5	7.4	59.1	0.3	0	0.9	2.2	14.2	1.2	0.1	1.3	12.6	40.9
grALG	6.1	1.1	1.9	42.6	9.4	0.1	0.9	7.4	9.6	10.3	10.6	0.2	57.4
grMOR	1	0.4	0.1	14.8	67.2	0.7	9.4	0	0.4	4.3	1.5	0.1	32.8
grKEN	3.4	3.5	1.1	0	1.1	75.7	0.1	0.1	10.3	2.5	2	0.2	24.3
unNIG	1.2	1.5	2.9	0	5.3	0	73.6	5.1	0.9	0	0.1	9.4	26.4
unRSA	4.5	7.6	13.7	4.1	0.1	0.6	4.3	55.7	3.4	2.8	0.2	3.2	44.3
unEGY	1.7	2.6	10.1	10.4	0.2	5	2.9	8.6	51.6	0.6	0.8	5.6	48.4
unALG	3.2	0	0.2	6.6	2.4	1	0	1.7	0.8	58.5	21.8	3.9	41.5
unMOR	3.1	0.2	0.3	13.1	2.8	2.4	0.2	0.1	0.8	25.8	50.8	0.5	49.2
unKEN	0.1	7.2	9	0.1	0	0.6	13.2	2	0.7	4.7	0.3	62.1	37.9
Contribution to others	26.5	31.8	45.5	62	23.8	26.4	35.4	44.4	37.6	54.7	45	39.6	472.7
Contribution including own	94.8	93.9	104.6	104.7	91	102.2	109	100.1	89.2	113.2	95.8	101.6	*TSPI (%) = 39.40%*
Panel B													
Contr. to others' gr	12.7	12.7	9.5	27.7	13.1	17							92.7 (21.66%)
Contr. to others' un	12.6	11.5	26.1	27.7	8	9							94.9 (22.17%)
Contr. to others' gr							14	24.5	29.8	10.5	20.4	16.8	116 (27.10%)
Contr. to others'un							20.6	17.5	6.6	33.9	23.2	22.6	124.4 (29.07%)

Source: The authors' computation.

except in Algeria, but generally low between countries. For instance, innovations in Nigeria's economic growth account for about 64.1% variations of Nigeria's GDP growth rates, but only for 1.6% of South Africa, 1.3% of Egypt, 6.9% of Algeria, 0.8% of Morocco, and 2.3% of Kenya. Similarly, innovations in other countries' output growth (South Africa, Egypt, Algeria, Morocco, and Kenya) are responsible for about 0.4, 1.5, 8.9, 2.6, and 0.7% of the 12-months ahead forecast error variance of GDP growth in Nigeria. Growth-to-inflation spillovers, both within and between countries are also low. The result further reveals that inflation-to-inflation spillovers within countries are high in most of the countries, except in Nigeria and Algeria. In addition, inflation-to-inflation spillovers between countries are low. Inflation-to-growth spillovers are equally low within and between countries. The total spillover index of 41.30% suggests a low connectedness between economic growth and inflation among top-income economies in Africa.

In Panel B of the Table, a more differentiated picture of the results was provided, the directional spillovers into growth-to-growth spillovers and inflation-to-growth spillovers was decomposed (termed 'Contribution to others 'gr'), as well as growth-to-inflation spillovers and inflation-to-inflation spillovers (termed 'Contribution to others' inf'). The results reveal that 31.95% of all four gross directional spillovers are from inflation-to-growth, with Nigeria, Kenya, and Algeria being the biggest contributors of growth-to-inflation spillovers to other countries. The proportion of GDP growth-to-GDP growth spillovers appears somehow small, having a mean value of 17.96%.

Table 5c. Spillover table for the full connectedness of inflation and unemployment in Nigeria and some top income economies in Africa.

To i	*From j* grNIG	grRSA	grEGY	grALG	grMOR	grKEN	unNIG	unRSA	unEGY	unALG	unMOR	unKEN	From others
Panel A													
infNIG	59.2	16.9	1.1	12.5	0.1	1	0	0.6	4.4	2	1.1	1.2	40.8
infRSA	11.1	60.3	1.7	1.2	2.2	0.6	1	0.6	13.7	0.5	7	0	39.7
infEGY	0.5	0.6	71.9	3.7	14.8	0.4	1.4	0.3	2.4	1	2.3	0.7	28.1
infALG	14	0.2	0.8	68	0	0.4	0.9	1.2	4.2	0	6.8	3.5	32
infMOR	0.1	0.9	6.8	0.1	52.6	0.7	2.1	7.8	0.6	0.9	0.8	26.6	47.4
infKEN	1.1	1	0.4	2.1	1.1	67.3	0.8	12.5	1.2	7.4	2.6	2.5	32.7
unNIG	0	1	0.5	0.4	2.5	0.1	79.9	5.4	2.4	0.1	0.1	7.6	20.1
unRSA	0.1	0.8	1.2	6.4	3.1	8.8	7.3	60.5	4	4	0.5	3.5	39.5
unEGY	2.3	8.1	0.9	1.5	1.8	4.5	4.1	10.7	58.6	0.2	1.1	6.2	41.4
unALG	2.1	1.8	0.1	0.3	0.5	4.3	0.2	2.9	0.6	62.7	20.9	3.5	37.3
unMOR	1.5	3	0.4	4.6	0.4	3.6	0.3	0.1	1.2	28.3	56.1	0.5	43.9
unKEN	1.3	0.1	1.1	4.5	15.3	0.3	9.9	2.2	1.6	5.7	0.6	57.3	42.7
Contribution to others	34	34.2	15	37.3	41.9	24.6	28	44.3	36.4	50.1	44	55.9	445.8
Contribution including own	93.2	94.6	86.8	105.3	94.5	91.9	107.9	104.7	95	112.9	100.1	113.1	*TSPI (%) = 37.10%*
Panel B													
Contr. to others' inf	26.8	19.6	10.8	19.6	18.2	3.1							98.1 (22.47%
Contr. to others' un	7.3	14	3.3	17.4	23.2	21.3							86.5 (19.81%)
Contr. to others' inf							6.2	22.4	24.1	11.8	19.8	32	116.3(26.64%)
Contr. to others' un							21.8	21.3	9.8	38.3	23.2	21.3	135.7(31.08%)

Source: The authors' computation.

Finally, with shares of 29.60 and 20.49%, growth-to-inflation and inflation-to-inflation spillovers make up some fractions of total spillovers.

Economic growth rate and the unemployment rate: The result in Table 5b shows that GDP growth-to- GDP growth spillovers within countries are large in nearly all the countries, except in Algeria but generally low between countries. This result is similar to what is presented in the preceding table. Similarly, unemployment-to-unemployment spillovers within countries are also high in all the countries.

In addition, unemployment-to-unemployment spillovers between economies, including unemployment-to-GDP growth spillovers within and between economies are very negligible small. The result indicates that innovation in Nigeria's unemployment accounts for about 74% of variations in Nigeria's unemployment, on the other hand, the innovations in Nigeria's unemployment account for just 4.3% of South Africa's unemployment, 2.9% of Egypt's unemployment, none for Algeria, 0.2% of Morocco and 13.2% of Kenya. At 39.40%, the total spillover index is low. In Panel B of the Table, the results reveal that 29.07% of all four gross directional spillovers are from unemployment-to-unemployment, with Algeria and Morocco being the biggest contributors of unemployment-to-unemployment spillovers to the other countries. The shares of growth-to-growth, growth-to-unemployment, and unemployment-to-growth spillovers in the gross

Table 6a. Spillover table for the full connectedness of economic growth and inflation in Nigeria and middle income economies in Africa.

To i	*From j* grNIG	grRSA	grEGY	grALG	grMOR	grKEN	unNIG	unRSA	unEGY	unALG	unMOR	unKEN	From others
Panel A													
grNIG	42.4	7.4	12.6	15.1	1.4	1.9	7.2	3.7	2.6	4.1	0.8	0.8	57.6
grBKF	8.6	40.4	8	6.1	12	5.9	0.4	12.8	3.3	0.1	2.5	0.1	59.6
grMAU	8	5.6	37.8	17	1.3	1.2	1.2	3.5	4.8	0.1	1.9	17.6	62.2
grNAM	9	4.3	15.5	40.5	0.2	1.9	1.5	7.4	9	3	0.2	7.4	59.5
grMAD	0.4	13.3	2.9	0.8	43	0.1	8.6	0.2	3.1	4.4	21.2	1.9	57
grGUI	1	3.7	0.7	2.2	0.2	63.5	2.3	14.4	1.6	5	2.7	2.8	36.5
infNIG	7.7	1	0.4	0.5	15.8	3.3	46.6	2.9	1.6	5	14.7	0.6	53.4
infBKF	2.6	8.9	3.3	8.9	0.1	13.3	1.4	48.6	1.8	6.6	3.6	0.9	51.4
infMAU	0.9	4.4	5.5	7.8	2.7	1	0.9	2	54.1	2.3	0.6	17.8	45.9
infNAM	3.7	0.6	0.2	6.1	2.2	6.7	4.3	11.9	2.8	57.6	1.9	1.9	42.4
infMAD	3.3	4.3	2.6	0.3	20.7	2.7	7.6	3.1	0.6	1.3	51.6	1.9	48.4
infGUI	0.2	1.4	15.2	4.6	1	3.6	2.4	0.4	13.2	2.2	1.5	54.4	45.6
Contribution to others	45.4	54.9	67	69.4	57.5	41.5	37.8	62.4	44.2	34.1	51.7	53.8	619.6
Contribution including own	87.8	95.2	104.8	110	100.4	105	84.4	111	98.2	91.7	103.3	108.2	TSPI (%)= 51.6%
Panel B													
Contr. to others' gr	27	34.3	39.7	41.2	15.1	11							168.3(32.65%)
Contr. to others' inf	10.7	11.7	21.7	22.1	21.8	27							115(22.31%)
Contr. to others' gr							14	29.2	19.6	13.7	8.1	27.8	112.4 21.81%)
Contr. to others' inf							16.6	20.3	20	17.4	22.3	23.1	119.7(23.22%)

Source: The authors' computation.

directional spillovers are 21.66, 22.17, and 27.10% respectively.

Inflation rate versus unemployment rate: Table 5c shows the spillover/connectedness between inflation and unemployment in top-income economies in Africa. In summary, the result indicates that inflation-to-inflation spillovers within countries are large in all the countries but low between countries. Similarly, unemployment-to-unemployment spillovers within countries are equally large in all the countries, but low between countries. Innovations in Nigeria's unemployment rate are responsible for about 80% of Nigeria's unemployment in Nigeria, while just 7.3 and 9.9% of South Africa and Kenya respectively. The result further reveals that inflation-to-unemployment spillovers within and between countries are low. In addition, unemployment-to-inflation spillovers within and between countries are low. In Panel B of the Table, the greater share of gross directional spillovers is from unemployment-to-unemployment which is about 31.08% of the total, followed by unemployment-to-inflation spillovers. Inflation-to-unemployment spillovers take the least share of 19.81%.

Spillover in Nigeria and five middle income economies in Africa

Economic growth rate and Inflation rate: Table 6a shows the level of connectedness/spillover between economic growth and inflation in Nigeria and the Five Middle-Income economies in Africa. The diagonal elements as usual represent the

Table 6b. Spillover table for the full connectedness of economic growth and unemployment in Nigeria and some middle-income economies in Africa.

To i	*From j* grNIG	grBKF	grMAU	grNAM	grMAD	grGUI	unNIG	unBKF	unMAU	unNAM	unMAD	unGUI	From others
Panel A													
grNIG	52.3	8.5	14	18	1.6	1.9	0.2	1.7	0.9	0.3	0.6	0	47.7
grBKF	9	44.2	9.2	7.6	13.5	6.4	0.7	1.1	5.4	0	2.7	0.1	55.8
grMAU	8.3	6.5	40.6	17.2	1.4	1.5	0	17.6	5	0.1	1.7	0	59.4
grNAM	10.2	5.4	16.4	45.1	0.4	1.5	9.8	7.3	0.7	2.3	0.8	0.1	54.9
grMAD	0.9	20.7	5	1	70	0.4	0.1	1.5	0.1	0.3	0	0	30
grGUI	1.4	3.7	1	2.4	0.6	70.5	3.3	5.4	1.9	1.8	0.2	7.7	29.5
unNIG	0.5	0.3	0	6.9	0	2.7	56	0.1	6.5	15.7	0.3	10.7	44
unBKF	1.1	0.5	14.4	4.5	0.4	4.4	0.3	66.4	1	0.3	6.7	0.1	33.6
unMAU	0.9	3.8	6.1	0.6	0.1	0.6	8.7	1.3	54.3	1.5	12.4	10	45.7
unNAM	0.1	0	0	1.7	0.1	0.6	19.4	0.4	0.6	66.5	10.5	0	33.5
Unmade	0.6	4.9	1.7	0.7	0.3	2	0.5	8.1	15	10.7	55.5	0.1	44.5
unGUI	0	0.1	0	0.1	0	2.4	21.1	0.1	12.8	0.8	0.1	62.5	37.5
Contribution to others	33.1	54.3	67.8	60.7	18.4	24.5	64.2	44.6	49.8	33.8	36.1	28.8	516.1
Contribution including own	85.4	98.5	108.4	105.8	88.4	95	120.2	111.1	104.1	100.3	91.6	91.3	TSPI (%) = 43%
Panel B													
Contr. to others' gr	29.8	44.8	45.6	46.2	17.5	11.7							195.6 (40.07%)
Contr. to others' un	2.7	9.1	16.1	12.8	0.6	10.3							51.6 (10.57%)
Contr. to others' gr							13.9	33.5	9	2.5	6	0.2	65.1 (13.34%)
Contr. to others' un							50	10	35.9	29	30	20.9	175.8 (36.02%)

Source: The authors' computation.

growth-to-growth and inflation-to-inflation spillovers within economies on one hand. On the other hand, the off-diagonal elements measure cross-variable spillovers within and between economies. Again, the result indicates that growth-to-growth spillovers within countries are generally small in all the countries, except Guinea. The results also reveal low growth-to-growth spillovers between countries. Innovations in Nigeria's economic growth account for about 42.4% of Nigeria's economy, while just 8.6% of Burkina Faso, 8% of Mauritius, 9% of Namibia, 0.4% of Madagascar, and 1% of Guinea. Similarly, innovations in other countries' GDP growth rates, Burkina Faso for example, are responsible for 7.4% of the 12-months ahead forecast error variance of output growth in Nigeria. Growth-to-inflation spillovers, both within and between countries are low. The result further reveals that inflation-to-inflation spillovers within countries are high in most of the countries, except in Nigeria and Burkina Faso. In addition, inflation-to-inflation spillovers between countries are low. Inflation-to-growth spillovers are equally low within and between countries.

In Panel B, the results reveal that 32.65% of all 4 gross directional spillovers are from GDP growth rate to GDP growth rate, and Namibia appears to be the largest contributor of GDP growth to GDP growth spillovers to other countries. With the share of 22.31, 21.81, and 23.22%, growth-to-inflation, inflation-to-growth, and inflation-to-inflation spillovers make up substantial fractions of total spillovers.

Economic growth rate and the Unemployment rate: The result in Table 6b shows that GDP growth -to- GDP growth spillovers within countries are large in three of the countries, namely: Nigeria, Madagascar, and Guinea, while low in the

Table 6c. Spillover table for the full connectedness of inflation and unemployment in Nigeria and some middle income economies in Africa.

To i	*From j* infNIG	infBKF	infMAU	infNAM	infMAD	infGUI	unNIG	unBKF	unMAU	unNAM	unMAD	unGUI	From others
Panel A													
infNIG	63.5	4.1	2.1	6.5	20.6	0.9	0.1	0.2	1	0.5	0	0.5	36.5
infBKF	1.9	66.5	0.6	8.9	2.2	2.2	7.9	3.6	1.1	3.2	1.1	0.6	33.5
infMAU	0.9	0.5	50.7	2.7	0.6	19	0.6	21	2	0.1	0.9	1	49.3
infNAM	4.1	10	3.1	61.6	2.3	2.9	4	2	1.2	1.2	7.2	0.3	38.4
infMAD	9.5	1.8	1	1.7	67.8	2.2	0	5.6	5.7	2.3	2	0.5	32.2
infGUI	2.7	0.7	11.6	2.8	1.5	52.7	0	23.4	3.2	0	0.8	0.6	47.3
unNIG	0	4.7	0.6	2.6	0	0	55.8	0.1	7.3	17.9	0.6	10.3	44.2
unBKF	1	1.6	14.5	3.4	1.9	22.1	0.3	48	1.1	0.8	5.2	0.1	52
unMAU	1.6	1.2	0.1	3.1	2.7	0.3	9.3	2.6	54.4	2.4	12.5	9.8	45.6
unNAM	0.9	0.4	0	1.2	0.9	0	15.7	0.8	0.4	67.8	11.5	0.3	32.2
Unmade	0	1.8	0.7	3.4	1.3	0	0.2	8.6	13.8	13.3	56.5	0.4	43.5
unGUI	0.3	0.6	1.9	0.2	0.3	0.1	20	0.2	14.4	0.6	0.1	61.1	38.9
Contribution to others	22.8	27.5	36.2	36.5	34.3	49.9	58.1	68.2	51.3	42.4	42	24.4	493.6
Contribution including own	86.3	94	86.9	98.1	102.1	102.6	114	116.2	105.7	110.2	98.5	85.5	TSPI (%)= 41.1%
Panel B													
Contr. to others' inf	19.1	17.1	18.4	22.6	27.2	27.2							131.6 (27.46%)
Contr. to others' un	3.8	8.7	17.7	12.7	5.8	22.4							71.1 (14.84%)
Contr. to others' inf							12.5	52.2	12.2	6.1	10	2.9	95.9 (20.01%)
Contr. to others' un							45.5	12.3	37	35	29.9	20.9	180.6 (37.89%)

Source: The authors' computation.

remaining countries. On the other hand, growth-to-growth spillovers between countries are generally low, and growth-to-unemployment spillovers within and between countries are also low. Similarly, unemployment-to-unemployment spillovers within countries are high in all the countries. In addition, unemployment-to-unemployment spillovers between nations and also unemployment-to- GDP growth spillovers within and between nations are small. The result indicates that innovations in Nigeria's unemployment account for about 56% of Nigeria's unemployment. On the contrary, innovations in Nigeria's unemployment account for about 0.3% of Burkina Faso and 21.1% of Guinea. The total spillover index is also low. In Panel B of the Table, the results reveal that 40% of all four gross directional spillovers are from growth to growth, with Namibia and Mauritius being the biggest contributors of the spillovers to the other countries. The shares of growth-to-unemployment and unemployment-to-growth spillovers are very small. Unemployment-to-unemployment spillovers make up a substantial fraction of the gross directional spillovers.

Inflation rate and the unemployment rate: Table 6c shows the spillover/connectedness between inflation rate and unemployment rate in five middle-income economies in Africa, namely; Burkina Faso, Mauritius, Namibia, Madagascar and Guinea. In summary, the result indicates that inflation-to-inflation spillovers within countries are large in all the countries but low between countries. Similarly, unemployment-to-unemployment spillovers within countries are

Table 7a. Spillover table for the full connectedness of economic growth and inflation in Nigeria and bottom income economies in Africa.

To i	*From* jgrNIG	grGAM	grSEY	grGUB	grCOM	grSTP	lnfNIG	infGAM	infSEY	infGUB	infCOM	infSTP	From others
Panel A													
grNIG	30.1	7.8	7.5	0.8	1.4	0.8	13.5	23.5	8.9	3.4	1.2	1.4	69.9
grGAM	5.2	37.3	16.4	8.3	0.8	0.2	8.2	6.4	4.4	10.4	1.5	0.9	62.7
grSEY	3.1	9.7	35.5	7.1	4.5	0.2	5.1	5.4	17.7	1.5	6.4	3.9	64.5
grGUB	0.1	6.3	9	57.1	0.8	0.3	0.4	0.1	1.2	20.9	0.8	2.8	42.9
grCOM	2.9	1	2.9	1.1	65.5	0.1	1.7	3.4	4.7	6.8	9.1	0.7	34.5
grSTP	2.4	0	0.5	0	0.2	50	7	10	6.4	0.4	1.8	21.5	50
infNIG	10.6	7.7	9	0.2	1.1	2.8	32.5	14.9	9.6	5.8	1.6	4.1	67.5
infGAM	17.5	6.2	9.3	1.1	1.9	4	14.1	28.9	5.9	4.2	2.7	4.1	71.1
infSEY	9.3	2.9	18.5	0.8	7	2.6	9.5	7.2	38	0.4	1.8	2.2	62
infGUB	1.3	9.9	4.6	19.3	11.2	0.3	5.4	2.9	0.2	42.1	0.4	2.3	57.9
infCOM	0.6	2	7.9	2.6	11.5	2.9	0.6	1	0.5	0.7	65.9	3.8	34.1
infSTP	2.5	0.8	2.8	2.2	1.6	16.3	8.8	7.9	0.5	4.7	2.8	49	51
Contribution to others	55.7	54.4	88.3	43.4	42	30.6	74.3	82.8	60.1	59	30	47.5	668.1
Contribution including own	85.8	91.7	123.8	100.6	107.5	80.6	106.9	111.8	98	101.1	95.9	96.5	TSPI (%) = 55.70%
Panel B													
Contr. to others' gr	13.7	24.8	36.3	17.3	7.7	1.6							101.4 (20.41%)
Contr. to others' inf	31.2	23.3	33.6	6.9	22.8	12.6							130.4 (26.25%)
Contr. to others' gr							22.4	42.4	25.6	22.5	11.7	9.7	134.3 (27.04%)
Contr. to others' inf							38.4	33.9	16.7	15.8	9.3	16.5	130.6 (26.29%)

Source: The authors' computation.

equally large in all the countries except in Burkina Faso, but low between countries. Innovations in Nigeria's unemployment rate are responsible for about 55.8% changes in Nigeria's unemployment. On the other hand, innovations in Nigeria's unemployment rate account for just 0.3, 9.3, 15.7, 0.2, and 20% changes in unemployment rates in Burkina Faso, Mauritius, Namibia, Madagascar, and Guinea respectively. The result further reveals that inflation-to-unemployment, as well as unemployment-to-inflation spillovers both within and between countries, are low. In Panel B of the Table, the greater share of gross directional spillovers is from unemployment-to-unemployment which is about 37.89% of the total, followed by inflation-to-unemployment spillovers. Inflation-to-inflation spillovers take the least share of 14.84%.

Spillover in five bottom income economies in Africa

Economic growth rate and Inflation rate: Table 7a shows the level of connectedness/spillover between the economic growth rate and inflation rate in Nigeria and the Five Bottom Income economies in Africa. The diagonal elements as usual represent the growth-to-growth and inflation-to-inflation spillovers within economies on one hand. On the other hand, the off-diagonal elements measure cross-variable spillovers within and between economies.

The result reveals mixed evidence of GDP growth-to-GDP growth spillovers within countries. GDP growth-to-GDP growth spillovers within countries are generally small in Nigeria, Gambia,

Table 7b. Spillover table for the full connectedness of economic and unemployment in Nigeria and some bottom income economies in Africa.

To i	*From j* grNIG	grGAM	grSEY	grGUB	grCOM	grSTP	unNIG	unGAM	unSEY	unGUB	unCOM	unSTP	From others
Panel A													
grNIG	57.7	15.2	13.7	0.3	2.8	1.5	0.1	0.1	0.4	0.1	0.1	8.2	42.3
grGAM	6.8	50.3	19.6	9.3	1.5	0	0.5	0.3	1.1	1.6	1.5	7.5	49.7
grSEY	4.4	14	56.9	7.9	6.9	0.4	0	0.2	1.8	0	0	7.3	43.1
grGUB	0.6	8.1	10	67.6	1.4	0.2	0.6	2.5	0	4	4	1.1	32.4
grCOM	2.3	1.2	2.3	0.3	63.5	0.2	4.6	3.8	15.3	3.1	3	0.3	36.5
grSTP	3.2	0	0.7	0.1	0.3	76.4	0.1	0.6	17.5	0.4	0.4	0.2	23.6
unNIG	0.1	0.9	0.1	0.4	4.3	0.1	74.7	5	1.2	6.8	6.2	0.2	25.3
unGAM	0	0.2	0.2	0.1	4.1	0.2	4.1	30.2	0.4	30.2	30.2	0.1	69.8
unSEY	0.1	0.4	3.3	0	9.3	12.8	2.3	0.7	69.5	0.6	0.6	0.4	30.5
unGUB	0.1	0.9	0	0.5	3.5	0.2	5.2	28.9	0.3	30.3	30.1	0.1	69.7
unCOM	0.1	0.8	0	0.5	3.4	0.2	4.9	29.2	0.3	30.3	30.3	0	69.7
unSTP	3.4	9	9.7	0.4	0.5	0.3	1.7	0.1	0.3	0.1	0	74.4	25.6
Contribution to others	21	50.8	59.5	20	38	16.2	24.1	71.4	38.6	77.1	76.2	25.4	518.3
Contribution including own	78.7	101	116.4	87.6	101.5	92.6	98.8	101.7	108	107.4	106.5	99.7	TSPI (%) = 43.20%
Panel B													
Contr. to others' gr	17.3	38.5	46.3	17.9	12.9	2.3							135.2 (27%)
Contr. to others' un	3.7	12	9.9	1.4	21.7	13.5							62.2 (12.42%)
Contr. to others' gr							5.8	7.2	34.3	5.2	6	24.4	82.9 (16.55%)
Contr. to others' un							18.2	63.9	2.5	68	67.1	0.8	220.5 (44.03%)

Source: The authors' computation.

and Seychelles; it is high in Guinea Bissau, Comoros, and Sao Tome and Principe. The result also reveals low growth-to-growth spillovers between nations.

Innovations in Nigeria's economic growth are responsible for about 30.1% variations in Nigeria's GDP growth rate, however, these innovations account for just 5.2% variations in Gambia's GDP growth, 3.1% of Seychelles, 0.1% of Guinea Bissau, 2.9% of Comoros and 2.4% of Sao Tome and Principe. Similarly, innovations in other countries' output growth, Sao Tome and Principe for example, are responsible for a 0.8% variation in Nigeria's GDP growth. Growth-to-inflation spillovers, both within and between countries are low. The result further reveals that inflation-to-inflation spillovers within countries are generally low except in Comoros. In addition, inflation-to-inflation spillovers between countries are low. Inflation-to-growth spillovers are equally low within and between countries. In Panel B, the results reveal that all four gross directional spillovers; growth-to-growth (20.41%), growth-to-inflation (26.25%), inflation-to-growth (27.04%), and inflation-to-inflation (26.29%) have equal shares in f total spillovers.

Economic growth rate and the unemployment rate: The result in Table 7b shows that GDP growth-to- GDP growth spillovers within countries

Table 7c. Spillover table for the full connectedness of inflation and unemployment in Nigeria and bottom income economies in Africa.

To i	*From j*infNIG	infGAM	infSEY	infGUB	infCOM	infSTP	unNIG	unGAM	unSEY	unGUB	unCOM	unSTP	From others
Panel A													
infNIG	39.9	19.1	11.4	7	2	5.7	0	0.2	0.5	0	0	14.1	60.1
infGAM	19.4	45.8	8.4	6.3	5.2	7.1	1	1	0.5	0.2	0.2	4.8	54.2
infSEY	14.6	10.3	59.3	1.1	3	2.7	0.1	0	6.2	0.1	0.1	2.5	40.7
infGUB	8.7	5.3	0.4	63.1	0.8	4	6	0.7	6.5	2.2	2.1	0.2	36.9
infCOM	0.7	1.4	0.7	0.7	72.5	3.2	8.5	1.4	6.8	1.6	1.8	0.8	27.5
infSTP	8.9	10.5	0.5	5.9	2.2	47.7	0.4	0.3	22.8	0.4	0.4	0	52.3
unNIG	0	1.8	0.2	2.8	8.5	0.4	65.6	5.5	0.5	7.4	6.8	0.4	34.4
unGAM	0.2	0.7	0.1	0.2	0.8	0.1	4.4	30.9	0.6	31	31	0	69.1
unSEY	1.4	2.8	2.9	4.8	3.8	18.7	0.2	0.8	63	0.7	0.7	0.3	37
unGUB	0	0.2	0.2	0.9	0.6	0.1	5.8	29.5	0.4	31.2	30.9	0.1	68.8
unCOM	0	0.2	0.2	0.9	0.6	0.1	5.5	29.8	0.4	31.2	31.1	0	68.9
unSTP	18.7	6.7	2.6	0.2	0.5	0	0.7	0	0.1	0.4	0.2	69.9	30.1
Contribution to others	72.6	59	27.4	30.8	28	42.3	32.6	69.2	45.3	75.2	74.2	23.2	579.9
Contribution including own	112.5	104.8	86.8	93.9	100.5	90	98.3	100.1	108.3	106.4	105.3	93.1	TSPI (%) = 48.3%
Panel B													
Contr. to others' inf	52.3	46.6	21.4	21	13.2	22.7							177.2 (31.45%)
Contr. to others' un	20.3	11.7	3.3	8.9	14.2	19.4							77.8 (13.81%)
Contr. to others' inf							16	2.6	37.1	2.3	2.8	22.4	83.2 (14.76%)
Contr. to others' un							16.6	65.6	2	70.7	69.6	0.8	225.3 (39.98%)

Source: The authors' computation.

are large in all the countries. On the other hand, growth-to-growth spillovers between countries are generally low, and growth-to-unemployment spillovers within and between countries are equally low. Similarly, unemployment-to-unemployment spillovers within countries are large in three of the countries while small in the remaining three countries. In addition, unemployment-to-unemployment spillovers between nations and also unemployment-to-growth spillovers within and between nations are negligible. At 43.20%, the total spillover index is considered somehow low. In Panel B of the Table, the results reveal that 44.03% of all four gross directional spillovers are from unemployment-to-unemployment spillovers, with Guinea Bissau, Comoros, and the Gambia being the biggest contributors of the spillovers to the other countries. The shares of growth-to-unemployment and unemployment-to-growth spillovers are very small, while growth-to-growth spillovers make up a substantial fraction of the gross directional spillovers.

Inflation and unemployment: Table 7c shows the spillover/connectedness between inflation and unemployment in five bottom-income economies in Africa. In summary, the result indicates that inflation-to-inflation spillovers within countries are large in three of the countries (Seychelles, Guinea Bissau, and Comoros) but generally low between countries. Similarly, unemployment-to-unemployment spillovers within countries are also large in three of the countries (Nigeria, Seychelles, and Sao Tome and Principe but low between countries. Innovations in Nigeria's unemployment rate are responsible for about 66% changes in Nigeria's unemployment, while it accounts for just 4.4% of Gambia's unemployment,

0.2% of Seychelles, 5.8% of Guinea Bissau, 5.5% of Comoros and 0.7% of Sao Tome and Principe. The result further reveals that inflation-to-unemployment, as well as unemployment-to-inflation spillovers both within and between countries, are low. In Panel B of the Table, the greater share of gross directional spillovers is from unemployment-to-unemployment which is about 39.98% of the total, followed by inflation-to-inflation spillovers. Inflation-to-unemployment and unemployment-to-inflation spillovers take the share of 13.45 and 14.76% respectively.

Summary of spillover results

Table 8 summarizes the outcome of the spillover analysis as presented in Tables 4a – 6c. The result indicates that variable to variable spillover within countries is largely high.

Robustness check

The robustness check was done using Cholesky ordering in the place of the generalized decomposition approach. Hence, we have re-ordered the variables and ordered the countries (descending order) by size in each category. Some of the results are reported in Tables A1, A2, and A3 in the Appendix. Overall, the results turn out quantitatively identical (Appendix Tables A1 to A3).

Conclusion

This study investigated the level of proximate between Nigeria and selected countries in Africa on one hand and the linkages between economic growth, inflation, and unemployment in these countries. We made use of part of the paper, the relative economic distance between Nigeria and fifteen other countries using quarterly GDP growth rates, inflation rates, and unemployment was first evaluated. Next, the characterization of the level of spillovers within and between economies using data on GDP growth rates, inflation rates, and unemployment. Then, countries of interest was separated into three categories, namely: Top Income, Middle Income, and Bottom Income Economies. From each category, five countries were selected and Nigeria is included in each category.

When evaluated using economic growth as an indicator, the closest economy to Nigeria's economy is South Africa, followed by Morocco in the top income category. In the Middle-income category, Namibia turned out to be the closest economy to Nigeria, followed by Mauritius. While in the bottom income category, The Gambia and Sao Tome and Principe are the closest economies to Nigeria's economy. Though the results are not statistically significant, they appear to be in tandem with what is obtainable in Africa. For instance, Nigeria and South Africa are the emerging giants of Africa. Politically, both countries are the dominant state entities in their respective sub-regions. They also have a history of cooperation with, and involvement in, a range of continental projects like the New Partnership for Africa's Development (NEPAD). Similarly, diplomatic relations between Nigeria and Namibia date back to the 2nd March 1990 following the country's attainment of independence. Since then, relations have been warm and cordial owing to the role Nigeria played during Namibia's liberation struggle with the provision of financial, material, and logistical support for The South West Africa People's Organisation (SWAPO). In recognition of these contributions, Nigeria was recognised as a frontline State despite its geographical location.

Generally speaking, the economic distance between Nigeria and selected African countries is considered far, compared to what is obtainable in covering the period 2000 to 2019. In the empirical developed economies. Mazurek (2012) for example, used the same approach and indicator (GDP growth) and found that the relative economic distance (in %) between the Czech Republic and the USA is 12%. These are countries separated by a geographic distance of 8255km (air travel). The results have great implications for African growth and development, especially given the fact that relative economic distance is conceptually related to the σ-convergence. Our result, therefore, suggests that the process of convergence is still low in Africa, group relative economic distance indicates that the level of globalisation is generally low among African economies.

The study further considers the linkages among output growth rates, inflation rates, and the unemployment rate for the sample of sixteen nations using spillover index estimates that mimic those of Diebold and Yilmaz (2012, 2014). Particular attention was paid to spillovers within and between countries. From the results obtained, we arrive at the following conclusions. First, variable-to-own variable spillovers within the country are generally large, though the level of transmission differs across categories. For example, growth-to-growth spillovers within the country are larger in the top-income economies than those found in the middle and bottom-income economies. This implies that growth reinforces growth. Similarly, unemployment-to-unemployment spillovers within the country are equally large and appear to be the same in the top and middle-income economies. This result also suggests that unemployment reinforces unemployment.

This argument is in line with the unemployment hysteresis hypothesis and may account for the reason for persistent unemployment in Africa. Inflation also appears to reinforce inflation within the economy. Second, variable-to-own variable spillovers between countries are

Table 8. The summary of spillover results.

Nature of Spillover	Top income economies		Middle income economies		Bottom income economies	
	Within country	Between countries	Within country	Between countries	Within country	Between countries
GDP Growth-to- GDP growth	large	Small	Mixed	Small	Large	Small
GDP Growth-to-inflation rate	Small	Small	Small	Small	Small	Small
GDP Growth-to-unemployment rate	Small	Small	Small	Small	Small	Small
Inflation rate-to-inflation rate	Large	Small	Large	Small	Mixed	Small
Inflation rate-to- GDP growth rate	Small	Small	Small	Small	Small	Small
Inflation rate -to- unemployment rate	Small	Small	Small	Small	Small	Small
Unemployment rate -to-unemployment rate	Large	Small	Large	Small	Mixed	Small
Unemployment rate -to- GDP growth	Small	Small	Small	Small	Small	Small
Unemployment rate -to- inflation rate	Small	Small	Small	Small	Small	Small

Source: The authors' computation.

small, suggesting that the level of cross-border interactions, especially in the form of economic activities is still very poor in Africa. This is evident in the volume of intra-African trade which is put at 12% of African total trade (AfDB, 2014). Third, variable-to-other variable spillovers both within and between countries are low. For instance, growth-to-inflation spillovers within and between countries are low in all three categories. This result indicates that growth within the domestic economies in Africa has not been inflationary. Available data shows that the fastest growing economy in Africa in 2020, South Sudan has an inflation rate of 7.5% and it is growing at 8.2%, Rwanda, the second fastest is growing at 8.1% with an inflation rate of 10.9%.Again inflation-to-unemployment spillovers and vice versa, within and between countries are low.

The central finding is that African economies are quite economically dispersed and the level of cross-border spillover is negligible. Suggesting that growth in one economy has not been influenced by the growth in the other economies within the region Given this, it was recommended that policies will improve intra-African trade which should be evolved.

Such policies should incorporate a trade-by-barter-like framework, where Africa can demand what it produces and produce what it demands. Thus, much more attention should be paid to the supply side of the market than the demand side following the Says law that increasing production will naturally result in proportionate increases in demand. To achieve this, enabling environment should be created to engender technological innovations while improving human and capital infrastructure.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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APPENDIX

Appendix A1. Cholesky ordering.

	unGUI	unMAD	unNAM	unMAU	unBKF	unNIG	grGUI	grMAD	grNAM	grMAU	grBKF	grNIG	From Others
unGUI	94.8	0.0	1.7	0.4	0.1	1.6	1.1	0.0	0.1	0.1	0.1	0.0	5.2
unMAD	0.1	87.8	0.0	0.3	0.7	0.3	2.3	0.5	3.0	0.2	2.2	2.5	12.2
unNAM	0.0	14.9	79.1	0.2	0.0	1.0	1.9	0.2	0.1	0.1	2.0	0.5	20.9
unMAU	16.9	23.2	0.3	51.9	0.4	0.1	1.9	0.1	0.8	0.0	0.3	4.1	48.1
unBKF	0.1	9.0	0.5	2.8	79.6	2.5	0.4	0.0	4.3	0.1	0.2	0.5	20.4
unNIG	18.3	1.0	29.3	4.4	0.5	43.9	0.0	0.0	0.4	0.0	0.3	1.9	56.1
grGUI	10.5	0.4	3.5	0.2	5.8	14.5	62.1	0.2	0.2	1.2	0.0	1.3	37.9
grMAD	0.0	0.1	0.3	0.2	2.4	0.7	0.7	93.1	2.0	0.2	0.0	0.4	6.9
grNAM	0.2	1.7	6.8	0.5	13.3	22.2	1.7	0.6	50.0	1.2	1.8	0.0	50.0
grMAU	0.1	3.9	0.2	11.1	36.9	0.8	0.4	2.0	18.4	24.0	0.4	1.8	76.0
grBKF	0.3	5.8	1.6	6.5	0.5	5.2	8.1	32.1	7.7	13.0	18.7	0.5	81.3
grNIG	0.0	1.0	0.1	1.0	2.2	3.0	1.3	2.8	33.2	3.5	9.6	42.3	57.7
Contribution to others	46.4	61.1	44.4	27.7	63.0	52.0	19.6	38.5	70.3	19.5	16.8	13.5	472.7
Contribution including own	141.2	148.9	123.5	79.6	142.6	95.9	81.7	131.6	120.3	43.5	35.5	55.8	39.4%

Appendix A2. Cholesky ordering.

	infKEN	infMOR	infALG	infEGY	infRSA	grKEN	grMOR	grALG	grEGY	grRSA	grNIG	From others
infKEN	92.7	0.8	1.4	0.0	0.5	0.9	0.2	2.1	0.3	0.3	0.7	7.3
infMOR	0.8	93.8	0.0	1.1	0.0	0.4	1.5	0.3	0.3	1.8	0.0	6.2
infALG	1.2	0.1	93.0	0.1	0.0	3.0	0.1	0.2	0.2	0.7	1.3	7.0
infEGY	0.2	22.3	1.7	71.9	0.0	0.7	0.5	0.4	0.0	1.4	1.0	28.1
infRSA	1.3	2.9	0.1	4.4	84.6	0.1	5.2	0.0	0.6	0.5	0.2	15.4
grKEN	5.4	0.8	1.8	1.7	29.1	57.8	2.2	0.1	0.0	0.7	0.4	42.2
grMOR	18.4	3.2	1.2	0.8	12.4	0.6	62.3	0.8	0.3	0.1	0.0	37.7
grALG	29.8	3.8	3.7	2.4	1.5	6.2	6.1	41.7	1.9	0.1	2.9	58.3
grEGY	5.1	4.4	5.1	7.0	2.3	3.6	1.8	2.3	66.5	1.8	0.0	33.5
grRSA	2.4	0.4	44.7	1.6	1.2	22.8	3.9	2.0	0.8	18.1	2.3	81.9
grNIG	2.0	0.2	0.3	15.6	0.4	6.8	2.3	5.9	0.5	0.3	65.6	34.4
Contribution to others	66.5	38.8	60.1	34.8	47.3	45.0	23.7	14.1	4.9	7.6	9.0	351.9
Contribution including own	159.3	132.6	153.1	106.7	132.0	102.8	86.0	55.8	71.5	25.7	74.6	32.0%

Appendix A3. Cholesky ordering.

	infSTP	infCOM	infGUB	infSEY	infGAM	infNIG	unSTP	unCOM	unGUB	unSEY	unGAM	unNIG	From others
infSTP	96.4	0.4	0.5	0.1	0.1	0.7	0.8	0.1	0.0	0.7	0.0	0.0	3.6
infCOM	4.0	87.9	0.8	0.2	0.3	0.9	0.2	0.7	0.0	0.9	0.1	3.9	12.1
infGUB	5.9	3.1	85.4	1.0	0.4	1.0	0.2	0.0	0.1	0.0	0.0	2.8	14.6
infSEY	4.2	3.0	1.3	87.5	0.0	0.9	0.3	0.0	0.0	2.3	0.5	0.0	12.5
infGAM	14.4	17.7	3.0	17.3	44.9	1.8	0.2	0.0	0.1	0.5	0.1	0.1	55.1
infNIG	13.6	9.3	6.9	29.2	4.4	35.3	0.0	0.0	0.1	0.8	0.3	0.0	64.7
unSTP	0.1	0.8	0.2	3.4	6.9	28.1	59.2	0.2	0.2	0.0	0.7	0.3	40.8
unCOM	0.4	1.8	4.0	1.0	1.8	0.6	1.9	83.2	1.5	0.1	1.8	1.8	16.8
unGUB	0.4	1.9	4.1	0.9	1.9	0.4	3.1	81.3	2.4	0.1	1.8	1.8	97.6
unSEY	26.0	1.1	1.9	4.5	1.7	5.6	6.4	0.3	8.1	43.7	0.6	0.1	56.3
unGAM	0.3	2.7	1.6	0.5	3.8	0.6	1.6	85.5	1.1	0.1	1.0	1.4	99.0
unNIG	0.6	11.8	2.4	0.6	2.3	2.4	0.3	8.1	39.4	3.5	1.5	27.1	72.9
Contribution to others	70.0	53.5	26.7	58.7	23.4	43.1	15.1	176.4	50.7	8.9	7.4	12.2	546.0
Contribution including own	166.4	141.4	112.1	146.2	68.3	78.4	74.3	259.5	53.1	52.6	8.4	39.3	45.5%

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Health impacts of small-scale gold mining in Kenyasi, Ghana

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Small-Scale Gold Mining (SSGM) is a way of life for many individuals living in mineral-rich but poverty-stricken areas of Africa. The sector provides many households with much needed income for their livelihood sustenance. Although the literature on SSGM have brought some consensus on environmental issues surrounding the sector, limited attention has been directed at health and safety issues associated with the small-scale gold mining processes. This paper contributes to fulfilling this gap. Based on a case study, the paper discusses the health and safety issues associated with each stage of the small-scale gold mining process. Mixed methods approach was used to gather relevant data and information through field observations, focus group discussions with miners, interviews with key informants, and content analysis of secondary data. The miners seem unaware of safe operating procedures and the health implications of the mining processes. Although formal regulations exist, there is lack of official oversight and monitoring of SSGM activities. Policy implications from the study are discussed. They include educating small-scale gold miners to raise health and safety awareness, and decentralizing permitting, monitoring and oversight responsibilities to local governments and institutions.

Key words: Galamsey, artisanal, small-scale mining, health and safety issues.

INTRODUCTION

Small-Scale Gold Mining (SSGM) is a major contributor to employment and poverty reduction in mineral-rich developing countries (Hentschel et al., 2003). Roughly 40.5 million people were directly engaged in SSGM in 2017 worldwide, up from 6 million in 1993. In contrast, only 7 million people worked in large-scale commercial or industrial mining by 2014 (IGF 2017). Today, an estimated 150 million people depend on SSGM across 80 countries in the global south (IGF 2017). More than a decade ago, Hayes and Wagner (2008) estimated that 9 million people were directly engaged in SSGM in Africa with another 54 million depending on the sector for livelihood. Thus, the sector provides financial security to families in some of the most poverty-stricken but mineral-rich regions.

SSGM is often regarded as a “get-rich-quick” activity pursued in communities lacking alternative employment avenues and reduces the tide of rural-urban migration in most African countries (IGF, 2017). Some writers use artisanal and small-scale mining interchangeably (Mwaipopo et al., 2004; Fisher et al., 2009). The former refers to the most rudimentary mining operations that use such simple tools as pickaxes, hammer and chisels whilst the latter refers to the more formalized small-scale mining

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Table 1. Legislation governing mining in Ghana.

Legislation	Focus
Minerals Commission Law of 1986 (PNDC Law 154)	Created Minerals Commission and governs all things mining including ownership, land acquisition and permitting, regulation, etc
Small-Scale Mining Laws of 1989 (PNDC Laws 217, 218, 219)	Legalized SSGM, created a permit system, and provided avenues for SSGM to sale gold.
The Environmental Protections Agency Act 1994 (Act 490)	Created the EPA and governs all industry regulations and minimum discharges.
The Minerals and Mining Act of 2006 (Act 703)	Redefined Law of 1986. Updates all aspects of mining legislation.

(Source: Government of Ghana 1989).

activities that use some modern machinery and technology (Mwaipopo et al., 2004).

A generally lack of monetary resources and limited regulations have resulted in many financial shortcuts and hazardous working conditions that present health and safety concerns for both artisanal and small-scale gold miners.

Artisanal small-scale gold mining has been practiced for centuries in Ghana though it was not officially legal until the 1989 Small-Scale Mining Laws were enacted to formalize the sector and provide avenues for miners to sell their products (Hilson and Potter, 2003). Despite being legal in the country, bureaucratic hurdles have resulted in many operations in this sector choosing to forgo licensing and working informally as *galamsey* (a local parlance for 'gather-them-and-sell'). These operations extract gold from deposits that are uneconomical on a large-scale nor require capital-intensive methods for extraction. Lack of government capacity to efficiently regulate *galamsey* operations has exposed miners to unsafe and unhealthy working conditions. Although the literature on SSGM have brought some consensus on environmental issues surrounding the sector, limited attention has been directed at health and safety issues associated with the small-scale gold mining processes (IGF, 2017). This paper contributes to fulfilling this gap.

Earliest records on mining suggest the indigenous people of Ghana mined gold for several centuries before Europeans arrived on the coast of the country in the 14th century and named it Gold Coast (Ofosu-Mensah 2011).

Small-scale gold mining (SSGM) activities were restricted after the colonial government enacted the Concessions Ordinance of 1900 that prohibited any person or groups from searching for minerals without a prospecting license (Ofosu-Mensah, 2011). Under this law, international commercial mining companies were given large tracts of gold-rich land (Aryee et al., 2003). In addition, the colonial government passed a Mercury Ordinance of 1932 which made it illegal to use mercury for small-scale gold extraction (Hilson, 2002).

The colonial mining policy was amplified in the 1980s with the implementation of Ghana's Structural Adjustment Program (SAP). The SAP heavily favored commercial mining operations and hence SSGM activities were pushed aside or technically remained illegal until the Provisional National Defense Council (PNDC) Laws 217, 218, and 219 were decreed in 1989 by the then military government (Hilson and Potter, 2005). Under Ghana's Fourth Republic, subsequent laws to regulate and streamline the SSGM sector included the Environmental Protection Act of 1994 (Act 490) and the Minerals and Mining Act of 2006 (Table 1).

These laws were intended to create a permit system, ensure appropriate supervision, and reduce the inherent adverse health and environmental impacts associated with the SSGM sector. Today, the sector accounts for almost two-thirds of the entire mining labor force in the country including thousands of workers enduring unhealthy and hazardous workplace environments (Amponsah-Tawiah, 2011). Yet, the sector has become a source of survival for many families residing in mineral rich areas of Ghana (Hilson and Pardie, 2006).

Small-scale gold mining methods vary depending on the scale of the operation, types of deposit, and the amount of available financial resources. The generic approach begins when gold bearing deposits are suspected a permit may be required from the relevant body or institution, vegetation is cleared, and soil is excavated until a gold-rich layer is discovered. Upon reaching this layer, the sediment is removed and transported to a nearby stream where it is sluiced to separate gold-bearing minerals and then combined with mercury and burned to create gold nuggets.

This is the most common method used by SSGM operations due to its cost-effectiveness and ease of access (Aryee et al., 2003). Recently, more advanced SSGM operations have employed deep hard rock mining techniques to intercept gold bearing reefs at depths of more than 50 feet. These techniques are the most complicated and are usually only carried out by operations that have financial resources available to acquire machinery and possibly skilled workers.

Miners construct shafts and tunnels to intercept gold-bearing rock and then follow the reefs. Heavy machinery

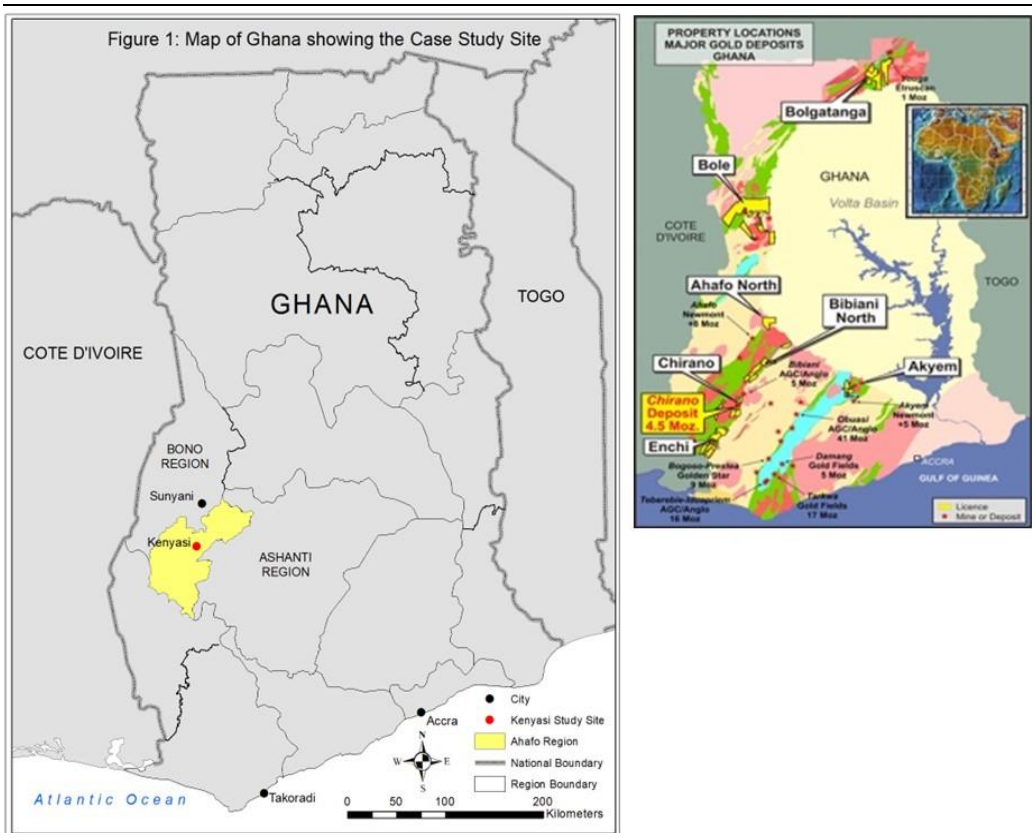

Figure 1. Study area.
Map Source: Authors, Minerals Map Source: Ghana Minerals Commission (2018).

or explosives are commonly used to break apart hard rock despite being officially illegal for SSGM operations. After the gold-bearing rock is excavated, it is crushed and milled before sluicing to isolate gold through mercury amalgamation (Aryee et al., 2003).

Bansah et al. (2016) have identified at least eight specific methods used to extract gold in the Ghanaian SSGM sector. They include the (a) *Anomabo* method which is used to scoop gold bearing gravels from river beds; (b) Chisel and hammer method which is used for mining hard rock formations occurring as outcrops; (c) Underground "ghetto" method for mining hard rock formations from old and abandoned underground mines; (d) Dig and wash method is used to mine alluvial gold deposits occurring on river banks, valleys, or terraces; (e) *Changfa* method which involves the use of a made-in-China diesel powered rock crusher; (f) the "More blade" method which involves the use of excavators for digging mine pits; (g) Dredge method involves direct suction of gold bearing sediments from a stream or riverbeds; and (h) Alluvial washing plant method which is a relatively more mechanized and less labor-intensive. With each of these techniques, SSGM workers are exposed to health and safety issues they are not equipped to handle. Based on a case study in Kenyasi, in the Ahafo region of Ghana, this paper discusses health and safety issues associated with SSGM in an attempt to promote more efficient policies and practices that could create a safer and healthier workplace for miners.

MATERIALS AND METHODS

Although gold deposits occur in several regions of Ghana, the majority of the Small-Scale Gold Mining (SSGM) operations are concentrated on areas around Bolgatanga, Bole, Ahafo North, Chirano, Enchi and Akyem (Figure 1).

Given the limitations of time and resources, this study focused only on one of these areas. The operations studied are located just outside Kenyasi in the Ahafo North and have been in existence since 2009 (Figure 1). The site was chosen due to its relative closeness to the researchers' summer field studies program camp in Sunyani. With institutional and official permission from the Ahafo District Assembly in Kenyasi, researchers were granted access to the SSGM sites where the extraction of gold in relatively small quantities occurs.

Mixed methods including participatory action research framework were applied. Relevant data and information were gathered through field observations, focus group discussions with miners, interviews with key informants, and content analysis of secondary data. Key informant interviews were conducted with key officials from the relevant government institutions. Data and information sought pertained to the steps in the gold mining process and the

Table 2. Health and Safety Issues.

Mining process	Activities	Safety issues	Health issues
Excavation	Suspected gold-bearing rocks are excavated using heavy machinery and explosives	Workers inhale silica dust and other particulate matter. High risk injury Noise pollution	Silica dust cause silicosis which has no known cure. Breathing problems Hearing impairment
Grinding	Hard rocks are passed through hammer mills to produce small grain ore	Workers inhale silica dust and other particulate matter, Noise pollution	Respiratory and cardiovascular problems, hearing impairment
Sifting	Small grain ores are passed through smoothing mills to produce fine grain ore	Workers inhale silica dust and other particulate matter	Respiratory and cardiovascular problems
Sluicing	Fine grain ores are sluiced to isolate ore containing gold	Workers are exposed to mercury ingestion	Kidney problems, Respiratory, central nervous and cardiovascular systems disorders
Amalgamation	Mercury is used to isolate gold from fine grain ore	Workers are exposed to mercury ingestion	Kidney problems, Respiratory, central nervous and cardiovascular systems disorders, reproductive problems, psychosis

Source: Author

health and safety issues at each stage of the process. Attention was focused on three aspects of the mining operations - (a) Mining/Excavation. (b) Extraction of gold, and (c) Communal structure of the operations and how they interact with each other to create gold nuggets.

RESULTS AND DISCUSSION

The mining operations in the study area cover several mini sites within the same vicinity, each with its own workers and management. The underground “ghetto” method is the most common technique used at the study site for mining hard rock formations from new or old and abandoned underground mines. Each site operates its own underground mining shaft. The shafts range in depth up to 100 feet and are dug until gold-bearing deposits are suspected. Miners dig tunnels and follow a gold-bearing reef (Figure 2). The tunnels are reinforced with wooden beams, and ventilation tubes are used to mitigate low oxygen levels, high temperatures, and dust. Although the use of explosives is illegal according to the 1989 Small-Scale Mining Laws in Ghana, the operations continue to use them to break apart hard rock within the tunnels (Government of Ghana, 1989). The handling and storage of explosives raise safety concerns. For instance, jackhammers are used to break apart hard gold-bearing rocks.

After a suspected gold-bearing rock is mined, it is uploaded to the surface and organized into sacks weighing roughly 50 pounds each (Figure 3). Each sack of suspected gold-bearing rock is sold for at least 480 Ghana Cedis ($55) to intermediary operators who extract the gold from the hard rock. The miners’ wages come from commissions on the sale of sack loads alone.

Therefore, the miners are incentivized to produce the most amounts of sack loads as possible to ensure they have enough money to provide for their families.

The sack loads of potential gold-bearing rocks are then transported to nearby improvised facilities and processed to isolate the gold. Here, hard rocks are spread over mats in the sun to ensure they are dry and small enough for machine processing. An individual is in charge of overseeing this step while manually seeking out larger stones to crush with a mallet. If stones are too large or not entirely dry, they can cause obstructions in the machinery. Once the size of stones or ore is deemed suitable, it passes through a series of mills to create a fine grain. The first mill is a hammer mill, commonly called a “crusher” by the local workers. It takes the larger stones and breaks them into small grain ore, typically about 2 cm in diameter (Figure 4a). This process is loud, and an abundant amount of silica dust is produced which is unhealthy for workers to breath into their lungs (Table 2). After this step, the small grain ore passes through another mill, called a “smoother,” which further refines the ore creating very fine grains (Figure 4b). This fine grain ore is then combined with water and sluiced to isolate ore containing gold (Figure 5a). Thereafter, it is combined with mercury to form an amalgam and eventually burned away leaving gold nuggets (Figure 5b). This gold is then sold through informal channels. Each of the operations at the site is able to secure at least between 10 and 15 pounds of gold per week. Figure 6 depicts the observed gold mining process at the study site.

Although the mining operations belong to different owners, they seemed linked and rely on the others for

Figure 2. Mining shaft.
Source: Author

Figure 3. Potential gold bearing rock.
Source:Author

Figure 4a. Hammer mill.
Source:Author

Figure 4b. Smoother mill.
Source:Author

Figure 5a. Washing.
Source:Author

Figure 5b. Sluicing.
Source:Author

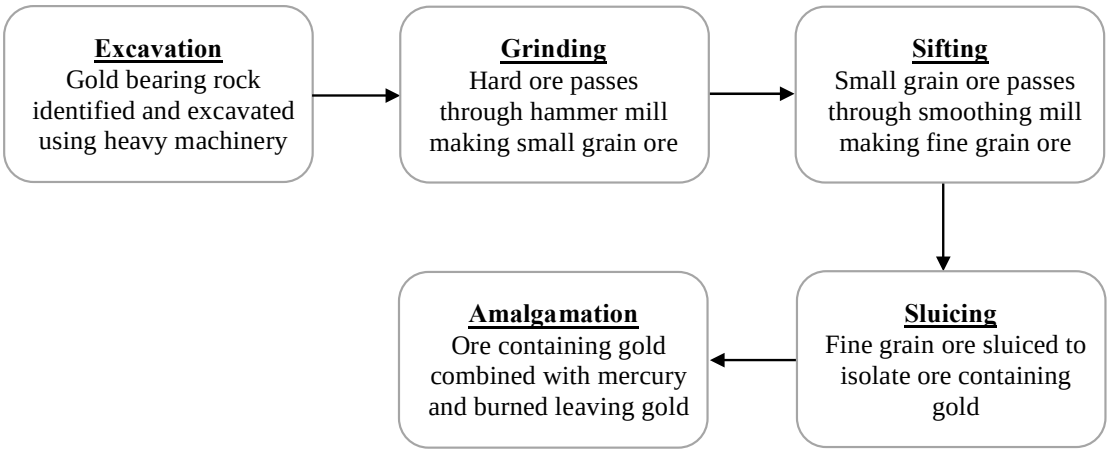

Figure 6. Overview of observed SSGM process.
Source: Field data

success. There are secondary economic benefits seen within and around the mining sites on the outskirts of Kenyasi. Several vendors and restaurants exist at the site, and the roadside was filled with petty traders and taxis taking people to and from the site. In this sense, the occupational health and safety hazards may not only affect the miners but also their families and immediate community either directly or indirectly. Due to the expansive and complex nature of the current operations at the sites, the miners have created a local mining council to manage their affairs. The council is an informal body that consists of a Chairman, Vice-Chairman, General Secretary, Treasurer, and an unarmed policing task force. So far, the council has not implemented any measures to address health and safety issues at the sites. The mining operations here are informal and several of the mine workers do not seem to understand the consequences of the exposures to silica dust, mercury, and other elements.

Health and safety issues

Health and safety issues identified stem from a lack of Personal Protective Equipment (PPE) such as breathing masks, ear plugs, hard hats, gloves, safety boots and protective eyewear. Unbelievably, none of the workers was observed using a breathing mask and miners were descending into the shafts with no hard hats nor protective eyewear. They simply had a flashlight taped to a side of the head (Figure 2), while heavy machinery operators were without safety boots throughout the excavation process. It was observed at the grinding and sifting stage that some workers had no breathing masks. At the sluicing stage, workers handled mercury with their bare hands (Figures 5a and 5b).

Moreover, the waste products are dumped in a nearby stream and can therefore enter the food chain. In this sense, mine workers and the surrounding communities are being exposed to high levels of mercury pollution. Those interviewed do not seem to understand the long-term consequences of mercury in their bodies and the ecosystem.

Exposure to mercury is a cause for serious health concerns including kidney, respiratory, cardiovascular and central nervous disorders. Others include memory loss, psychosis and reproductive problems (Donkor et al., 2006; Oduro et al., 2012). The focus group discussions also revealed that none of the underground mine workers use ear plugs or hearing protectors to minimize the impact of noise pollution from blasting. Tunnel collapse is a cause for concern due to lack of inspections and reinforcement of tunnel walls. This elevates the likelihood of accidents occurring coupled with a lack of PPE and the general lack of health and safety awareness among the mine workers.

Regulatory institutions

Small-scale gold mining operations are required to abide by all applicable laws in the country including seeking permits from the relevant institutions. Yet, none of the operations at the site had secured a permit from any of the relevant institutions. The institutions include the Minerals Commission, Environmental Protection Agency (EPA), Forestry Commission, Lands Commission, and Water Resources Commission (Table 3). According to the miners, they operate informally because the process for obtaining SSGM permit is costly and lengthy. It can take upwards of 6-8 months for the registration process with the Ghana Minerals Commission alone. Similarly, no environmental permit was sought, as required by law, from the Environmental Protection Agency.

Table 3. Relevant government institutions.

Institution	Focus
Minerals commission	Responsible for regulating and managing all mineral resources in Ghana. Coordinates and implement policies relating to the mining sector. Assists the Minister responsible for mines with small-scale licensing procedures and monitoring of operations as well as establishing small-scale mining district centers.
Environmental protection agency	Carries out government policy, inspections, issues environmental permits, and regulations pertaining to the environment. Monitors activities of mineral rights holders to ensure compliance with terms and conditions. Has power to cancel, suspend or revoke mining permits.
The forestry commission	Regulates the use of forest and wildlife resources. Section 18 of Act 703 requires a mineral rights holder to obtain a permit from the Forestry Commission before mining activity is undertaken in the forest.
Lands commission	Manages public lands and registers title to land. Responsible for land valuation and compensation to individuals by mining companies.
Water resources commission	Responsible for the regulation and management of the utilization of water resources. Expected to monitor and sanction mining activities polluting water bodies.

(Source: compiled by authors).

Consequently, there is a lack of official oversight and monitoring of the mining operations at the site. Interviews with key officials in these institutions revealed the day-to-day challenges in the quest to address safety and health issues at the mining sites. There is a generally lack of personnel and logistics to monitor and enforce health and safety regulations as most of the SSGM activities are geographically scattered and not easily accessible by road. Since the SSGM operate informally, they are often at loggerheads with government officials attempting to monitor their operations and enforce the applicable laws. Also, there is insufficient coordination among the regulatory institutions to ensure compliance within the small-scale gold mining sector. The institutions are yet to have local presence in the Ahafo Region. The closest regional offices are located in Sunyani, the capital city of the Bono Region which is quite a distance from the study site.

Nicole et al. (2016) observed that safety and health issues surrounding small-scale gold mining often focus on the need for mercury-free mining technologies but the foregoing findings reveal other pressing issues. For instance, silica dust accumulates throughout the excavation, grinding, and sifting processes. According to the United States Department of Labor (2002) silica dust is harmful to breathe and has been classified as a human lung carcinogen. The silica dust can also cause silicosis which has no known cure. It causes scar tissue to build in the lungs and eventually reduces the victim's ability to take in oxygen or become more susceptible to lung infections such as tuberculosis. Due to the slow and chronic nature of impacts to health by silica dust, many workers do not realize the extent of the damage until it is too late (Nicole et al., 2016).

During the final stage of the gold extraction process, workers use mercury to isolate gold from fine grain ore. Due to a lack of PPE use, there are no barriers between mercury and the workers thus causing elevated risks for mercury-related health impacts. This is because mercury is a neurotoxin, and bio-accumulates, meaning that once absorbed by an organism it accumulates due to the long biological half-life and the rate at which it is lost by catabolism and excretion (Tschakert 2007). Prolonged exposure to mercury leads to mercury poisoning which can cause difficulty breathing, tremors, emotional changes, neuromuscular impacts, kidney damage, and respiratory failure depending on the levels of exposure (Veiga et al., 2006; United States Environmental Protection Agency, 2017). When used in the gold extraction process, it forms an amalgam and turns into methyl-mercury compound. When emptied into rivers and other water bodies it can easily enter the food chain (Oduro et al., 2012). A study by Ghana's Council for Scientific and Industrial Research (CSIR) revealed that many SSM communities in the Western Region of the country are at risk of serious health-related problems due largely to mercury in water bodies (Yeboah, 2013).

There seems to be appropriate regulations in place through the 1989 Small-Scale Mining Laws, but Ghana continues to struggle with illegal small-scale activities through unregistered operations and the use of banned extraction techniques (Hilson et al., 2007). In this case study, it is obvious current government institutions lack the capacity to effectively oversee and regulate SSGM in ways that ensure to healthy and safe mining activities. According to Teschner (2012), mining laws in Ghana are not effectively capturing small-scale goldmining activities. This is largely because of the top-down regulatory framework of the central government. A bottom-up approach through local government would be more efficient as it can create a mutually beneficial relationship. Decentralization of oversight responsibilities could be

the best antidote to the failed centralized bureaucratic system (Agomor et al., 2019). Unlike central government institutions, local governments are closer to SSGM sites and are therefore in a better position to help mitigate the health and safety vulnerabilities associated with small-scale goldmining activities. They are well-positioned to improve service delivery at the local levels. Many individuals in rural mining communities heavily rely on mining as a source of revenue that ensures the well-being of their households (Tuokuu et al., 2018). Local governments could implement educational programs or workshops to raise miners' knowledge and awareness of health and safety issues associated with the SSGM sector. They can be given the oversight responsibilities of mining operations including helping to formalize those operations. This would be mutually beneficial for both the local government and SSGM operations. Local governments would enjoy increased tax revenues from SSGM operations that could help provide essential infrastructure needs in rural communities such as maintaining roads, providing reliable electricity, and potable water. This relationship could spark a positive feedback loop and facilitate exponential growth and sustainability in rural mining communities.

Conclusion

The literature on SSGM has largely focused on the environmental impacts and the root causes of its prevalence. In a recent paper, Achina-Obeng and Aram (2022) reveal that the desire for economic survival remains a major priority of small-scale gold miners than the conservation of the environment. This is not strange because limited attention has been directed at uncovering the health and safety issues associated with the small-scale gold mining processes.

This paper highlights health and safety issues at each stage of the small-scale gold mining (SSGM) process. Despite being legal, bureaucratic hurdles have resulted in many SSGM operations choosing to operate as informal entities.

There is a lack of official oversight and monitoring of the SSGM operations due largely to the failure of centralized bureaucratic institutions as the latter faces several challenges. The challenges include: (a) lack of coordination and overlapping regulatory functions; (b) inadequate personnel and logistics to monitor and enforce health and safety violations; and (c) the need to raise the awareness of the mine workers regarding safety and health impacts of mining activities through occasional workshops. Generally, the miners seem unaware of safe operating procedures and the health implications of the mining processes. Education and decentralization of oversight responsibilities to local governments and institutions is the key to mitigating negative health impacts associated with SSGM operations in Ghana and similar African countries.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Integration of traditional ecological knowledge and western science in natural resources management in the Okavango Delta, Botswana

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Since time immemorial indigenous people (IP) utilised resources to meet their cultural needs. While the long-established utilisation of these resources modified land, however, the alteration was negligible with fewer detrimental impacts on the environment. The adoption of Western Science (WS) saw people shunning the traditional ecological knowledge (TEK), resulting in accelerated resources degradation. Utilising institutional bricolage theory, this study combined remote sensing, geographical information systems, literature review and survey data to examine land use and land cover (LULC) change in three villages within the Okavango Delta and the role of TEK in resources management with a special reference to vegetation, land and water. Results revealed a widespread conversion of land and related resources and also that the adoption of formal education and religions significantly affected the utilisation of TEK in the management of resources. The study concludes that TEK is vital and is crucial in the conservation of natural resources.

Key words: Indigenous, land use and land cover (LULC), Shakawe, traditional ecological knowledge (TEK), remote sensing, religion, water.

INTRODUCTION

There are promising chances of integrating traditional ecological knowledge (TEK) and Western Science in natural resources management regardless of the differences existing between the two genres of knowledge (Hoagland, 2017). On the one hand, TEK refers to the knowledge and beliefs held by indigenous people (IP) (Huntington, 2000) and on the other hand, Western Science (WS) is the knowledge that emanates from established universal scientific principles (Horton, 1967). It is the knowledge derived from a series of experiments and observations under the auspices of scientists. Thus, TEK is a collectively owned body of practices, taboos, values and sciences, passed on from one generation to another, orally (Millar, 2018). It is complex, hidden and is understood better by the people themselves than by "outsiders". Whereas WS relies on

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documentation as a medium of transmission, TEK is orally transferred from one generation to generation (Warren, 1996). Thus, TEK is knowledge inherited from ancestors and one generation is bound to utilise and transmit it to the next generation (Usher, 2000), and WS is knowledge generated from laboratories (Schwartz et al., 2004). Based on Berkes' study (2000) TEK is synonymous with indigenous knowledge (IK) as both refer to the information about the interconnectedness of the natural environment, IP and all other living and non-living components. This is the knowledge IP have inherited from their ancestors and are at liberty to transfer it to the next generation (Usher, 2000). Thus, IK is a unique type of knowledge to a given culture different from the knowledge generated by institutions of higher learning and private firms (Warren, 1996; Kolawole, 2015).

Based on Berkes et al. (2000) TEK is qualitative, unlike WS which is quantitative. While TEK is intuitive and holistic (Johnson, 1992), WS is purely rational and reductionist (Schwartz et al., 2004). According to Martin et al. (2010), TEK as a genre of knowledge regards the mind and matter as a single entity, unlike in WS where the two are treated separately. Therefore, TEK is a moral type of knowledge as opposed to WS which is value-free (Klubnikin et al., 2000). According to Mackenzie (2018), TEK is spiritual and WS is mechanistic. Also, TEK is characterised by a slow build-up of facts through trial and error while WS relies on experiments and systematic accumulation of facts. In the opinion of Berkes et al. (2000), in TEK the users generate the data themselves as opposed to WS where data is produced by a few individuals who are experts in scientific enquiry. The TEK is diachronic meaning it is based on data gathered over a very long period spanning into centuries as opposed to WS which is synchronic designating data gathered over a short period but on a large area (Williams and Hardison, 2013).

Literature has shown that a natural resource management (NRM) framework that ignores TEK is bound to fail (Tripathi and Bhattarya, 2004; Kapfudzaruwa and Sowman, 2009). Experiences have shown that sustainable NRM is complex and therefore requires a systems approach. In this regard, the systems approach denotes research that is interdisciplinary whereby bio-physical, socio-economic and cultural phenomena are jointly embraced to comprehend the intricate nature of human and natural resources nexus (Barr and Dixon, 1998). To solve the complex and interrelated nature of sustainable NRM, Tripathi and Bhattrya (2004) recommend community-based participation in resources management. The inclusion of IP in resources management is a valuable approach because the decisions made concerning natural resources can capture their expectations and aspirations. There is a consensus amongst scholars that TEK plays a significant role on issues bordering local, national or perhaps international NRM (Menzies, 2006). This follows the realisation that WS alone contributes less to the development of local areas (Mercer et al., 2007). Based on Clark (1994) the depletion of natural resources is attributed to ignorance of the local culture. Thus, embracing TEK helps to preserve important skills and technologies that are crucial in mitigating the problem of natural resources depletion. Ogunbameru and Muller's (1996) opine that integration of WS and TEK has the propensity for complementing each other's strengths and weaknesses. Based on Tripathi and Bhattarya (2004) the systems approach calls for documentation and mapping of TEK to preserve the knowledge held by our forefathers – a unique form of knowledge. However, literature has shown that attempts to gather information from a wide range of IP are laborious, costly and time-consuming (Kajembe and Rutatora, 1999; Adam, 2007). The proper storage of TEK is crucial because it provides easy access to data for use by stakeholders, especially planners and policymakers. Thus, the integration of modern technology comprising geographic information system (GIS), remote sensing (RS) and TEK enhances information bordering the management of resources at a local area. GIS and georeferenced remotely sensed data have the propensity for creating maps that can easily be applied in natural resources management at local levels (Mercer et al., 2007). The spatial aspect of TEK facilitates its integration with WS in NRM at the local level and this enhances decision-making processes.

From the IP's perspective, everything within the natural environment is densely embedded with ideas and is full of meanings (Johnston et al., 2011). Human worldviews are full of meanings and every object or scenario created has a meaning encoded to it and land, vegetation and water are not an exception (Strang, 2008). The meanings attached to objects influence every interaction that people have with these objects and with each other. In this way, land, vegetation and water signify various qualities including as a form of livelihood sustenance, that evoke belonging and habitat for powerful spirits (Adolina, 2012). Consequently, the integration of TEK and WS is vital because the NRM framework that is deep-rooted in the cultures of a local community is potentially more sustainable (Jackson, 2017; Andolina et al., 2009). In indigenous communities (IC), vegetation and water are depicted through symbols and artefacts (Mooney and Tan, 2012). Values, beliefs and norms form the core of any culture and the NRM system must embrace such cultural attributes. They have to do with feelings about what is good or bad. Culture is the shared perceptions, behaviour and symbols conveyed from generation to generation through learning (Clifford, 1988). It is the way of life socially acceptable in a community. Literature has shown that to achieve sustainable NRM as an agenda for development, a balance needs to be found between

social and economic factors (Kolawole, 2009). The sustainable development concept aims at satisfying the needs of the present generation without jeopardizing the capability of future generations to meet their requirements (Jabareen, 2008). Thus, the sustainability concept entails managing resources to ensure perpetuity in the use of resources (Burger et al., 2001).

Vegetation and water are vital resources with economic, societal and spiritual functions (Blackstock, 2001). From literature, natural resources play a fundamental role in the life of IP (Strang, 2008, 2014). Failure to recognise the significance of culture in NRM, no sustainable solutions can be found (Nakata, 2002). This is because relations between people and their environment are embedded in the culture. The intimate relationship between natural resources and people should be explicitly considered in all decision-making processes. From a cultural point of view, how vegetation and water are conceived and valued determines how they are managed (Hens,2006). It has been shown that imported management strategies that fail to take into consideration the local people's cultural values usually fail (Hens,2006). This is because cultural diversity developed over time by local people contain a trove of sustainable practices and innovation that proved to be resilient. The objective of the study is to examine the nexus between traditional ecological knowledge also referred to as indigenous spatial knowledge and WS in the analysis of dynamics of land use land cover and change in the Okavango Delta in Botswana.

THEORETICAL FRAMEWORK

The underpinnings of this paper are based on Cleaver (2001)'s institutional bricolage theory, an offshoot of the mainstream institutional theory proposed by Elinor Ostrom in 1990. Cleaver (2002) argues that it is vital to understand what constraints enable people to behave in the way they do and consider such issues when crafting rules to guide the management of resources. Thus, the theory's main tenet is that there exists more than one institutional arrangement at the local level which are equally important in the formulation and enforcement of rules. Accordingly, sustainable, equitable and efficient NRM requires the integration of both local and national level rules in the management of resources. The theory underscores the joint utilisation of local and national institutions in NRM. The coexistence and interaction in a positive way of the two genres of institutions is a stepping-stone towards the neutralization of the contradictions existing between local and state institutions (Gondo et al., 2020). This paper argues that instead of embracing WS as the sole arrangement in controlling behaviour and decisions bordering resources utilisation, the best approach is a scenario where the perspectives of the local people and their experiences are reflected in the rules and regulations of NRM.

METHODOLOGY

Profile of study site

The study sites comprise Shakawe (in the upper delta), Tubu (middle delta) and Shorobe (lower delta). There were four ethnic groups comprising BaSarwa, BaYeyi, BaHerero and HamBukushu in the study area. The remoteness of the sites offered a favourable place for studying the integration of TEK and WS in understanding the variables affecting LULC and NRM.

Study design

The main thrust of the investigation was to examine the integration of TEK and WS in understanding the dynamics of LULC change with a special interest in land, water and rangeland resources. Three aspects characterise the methodology. These include satellite image processing to identify the dynamics in resources over space and time, literature review and a cross-sectional approach. The cross-sectional design approach was adopted because the method enabled data collection as a one-time event (Mthembu et al., 2016). This helps because in a cross-sectional design there is no need for further investigation. Thus, the process is inexpensive (Garn et al., 2018) and a literature review approach helps to widen the scope of the integration of TEK and WS. It also helps to determine what is known on the topic of interest (Rojas-Lema, et al., 2021), how well this knowledge is established and where future research might best be directed (Rozas and Klein, 2010).

Sample size

In this study, the random sample was made up of the listed 2011 census households in three villages of Shakawe, Tubu and Shorobe which was updated to incorporate new households that could have emerged after the 2011 census. Enumeration area (EA) maps for the 2011 national census were used to verify the number and location of all households in each of the villages. The sampling frame was all the households in the three villages which were randomly selected from all the villages in the Okavango Delta. The total number of households (HHs) in the three villages was 1669. To determine the sample size of HHs for each village, the number of HHs of each village was used as the population. Then the total HHs sample size for each village was calculated using the *Taro Yamane* formula with a 95% confidence level. Substituting in the formula the sample size of HHs for each village was obtained as Tubu 91, Shorobe 55 and Shakawe 315 and the results are tabulated in Table 1. The Taro Yamane formula is shown below:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= sample size; N = number of people in the population;(e) allowable error

Data collection

Data was collected using interview schedules, key informant guides and a review of related literature. The interview with village chiefs

Table 1. Population and sample size of each village in Okavango Delta.

Village	Population	Mean HHs	Sample HHs
Tubu	626	118	91
Shorobe	1031	64	55
Shakawe	8350	1487	315
Total	10 007	1669	461

Source: Author

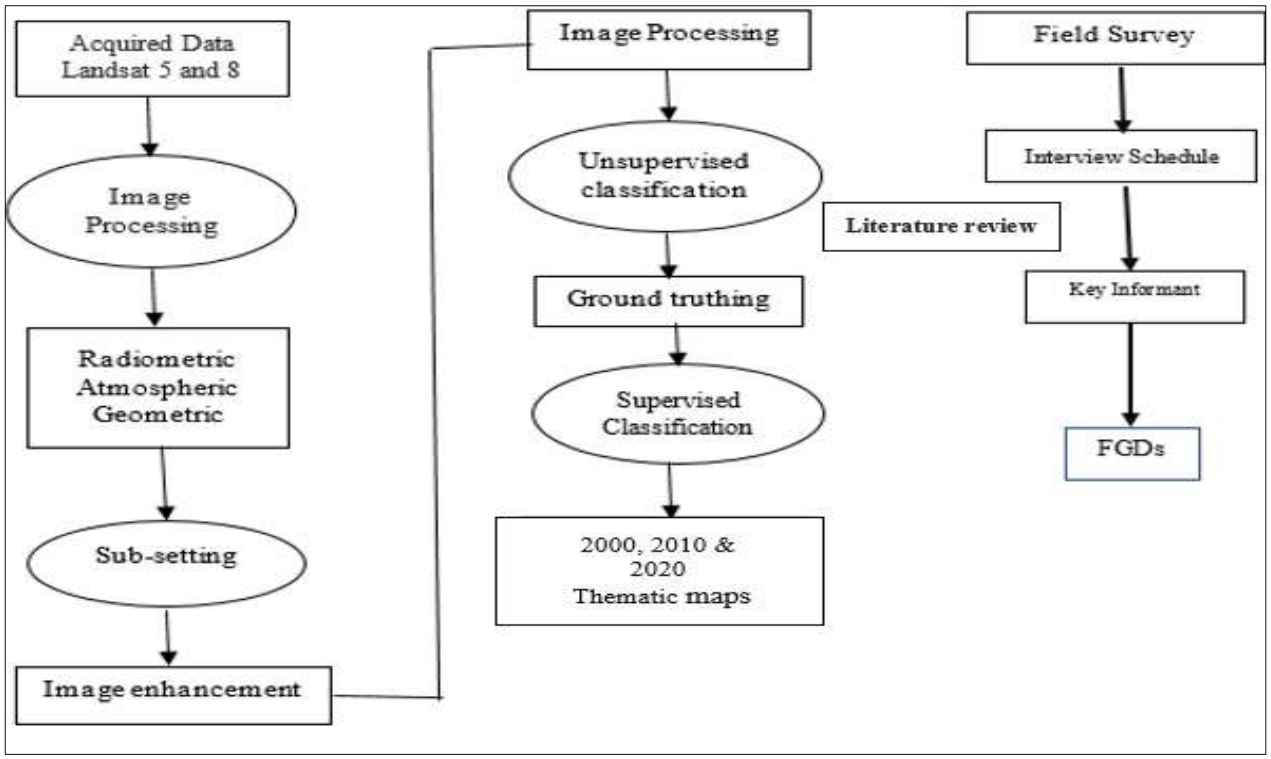

Figure 1. Methodology summary.
Source: Author

(dikgosi) and elders enabled key topics to be discussed. Thus, enabling the investigator to gain further insights into how TEK and WS knowledge can be integrated into the management of natural resources in the study area. Figure 1 is a summary of the key aspects of the methodology.

Data were gathered in two stages. Firstly, satellite images were downloaded freely from the United States Geological Survey (USGS). These images were processed using Quantum Geographical Information system 3.2 (Q-GIS 3) and ArcGIS 10.8. Processing involved radiometric correction - done to improve the fidelity of the brightness value magnitude (Wang et al., 2021), atmospheric correction conducted to remove the effects of the atmosphere on the reflectance values of images (Hadjimitsis and Clayton, 2008) and geometric correction, a process to transform the coordinates and dimensions of a remotely sensed image to eliminate spatial distortions in the original image (Wang et al., 2021). This was followed by image subletting, implying a process of extracting only the region of interest. Following this was image enhancement meaning a process of improving the quality and information content of the original data before processing. Lastly, image classification to produce a thematic map as shown in Figures 3-5 was done. Five LULC namely open spaces, shrubs/trees, hydrophytes, water and built-up were generated from the classification process. The second part of the data collection process involved a field survey where four well trained degreed field assistants well versed in the Setswana local language were engaged. Data were gathered from household heads (HHs) and key informants interview schedules and FGDs.

While Figure 1 shows the methodology, Figure 2 is a map of the study area. Data was gathered from Shorobe Tubu and Shakawe in the lower, middle and upper delta respectively. The results section is organised into three major sections comprising the spatial analysis section where the spatio-temporal data from satellite images are analysed and maps produced to show the dynamics of natural resources from 2000 to 2020. This is followed by the discussion section, a section that draws much of the data from the literature, focus group discussions and interviews with the local people and the last section is the conclusion which summarises the

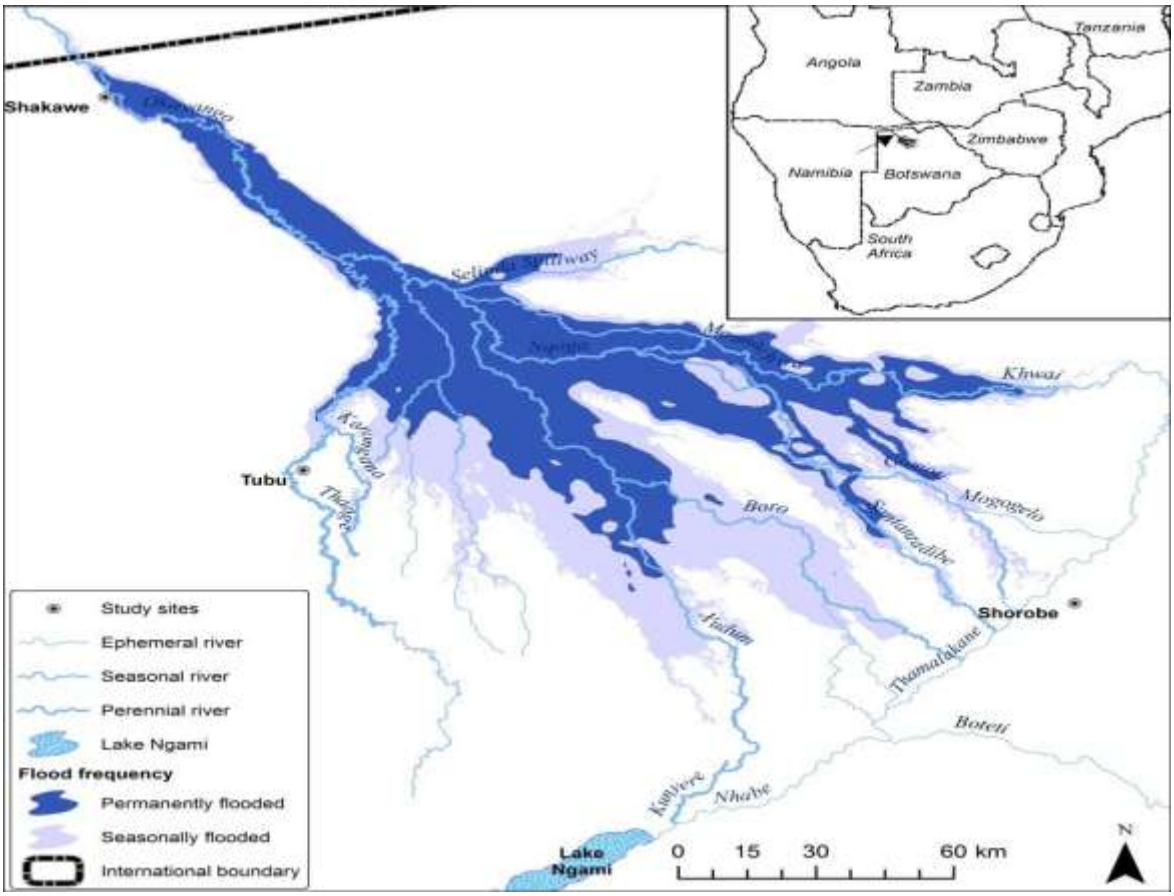

Figure 2. Map of the study area. source ORI GIS Lab, (2016).

paper.

RESULTS

Spatial analysis results for the period 2000 - 2020

The satellite image analysis reveals that there were five major LULC classes were identified for the duration stretching from 2000 to 2020 (Figures 3 to 5 and Tables 2 to 4). The five categories comprise shrubs/trees, built-up, hydrophytes, water and open spaces. The LULC findings show that in the year 2000 open spares covered 5.5, 16 and 95.9 hectares (ha) in Tubu, Shorobe and Shakawe respectively. The shrubs/trees land cover category covered 65.7 ha in Tubu, 78.3 ha in Shorobe and 96 ha in Shakawe. The largest (76.7) ha of land was covered by hydrophytes in Shakawe and the least (10.7) ha was in Tubu. Water covered 10.7 ha in Tubu and 52.6 ha in Shorobe in the same period. In Shakawe, water covered 30.7 ha.

Findings on LULC for the year 2010 in the three villages show that while open spaces covered 11.2, 20.3 and 65.9 in Tubu, Shorobe and Shakawe, shrubs/trees covered 23.4 ha, 62.9 ha and 96.2 ha in the three villages respectively (Figure 4 and Table 3).

The results show that 7 ha and 35.8 ha were under hydrophytes in Tubu and Shorobe respectively and 71.4 ha were under the same land cover in Shakawe in the year 2010.

In Tubu, while water occupied 25.9 ha, it also occupied 79.3 and 76 ha in Shorobe and Shakawe respectively. The built-up area was 28.4 ha in Tubu, 60.6 ha in Shorobe and 76 ha in Shakawe in 2010.

The LULC characteristics of the three villages in 2020 show that open spaces occupied 10.1 ha, 11.2 and 57.8 ha in Tubu, Shorobe and Shakawe, respectively. The shrubs/trees land use covered 18.9 ha in Tubu, 45.7 ha in Shorobe and 66.1 ha in Shakawe in the year 2020. Whereas hydrophytes occupied 15 ha, 37.5 ha and 27.3 ha in Tubu, Shorobe and Shakawe, respectively, water occupied 6.7 ha in Tubu, 18.5 ha in Shorobe and 28.2 ha in Shakawe. The largest (149.6 ha) built-up area in the year 2020 was in Shakawe and the least (45.2 ha) was in Tubu. Shorobe had 146 ha under land use designated as built-up.

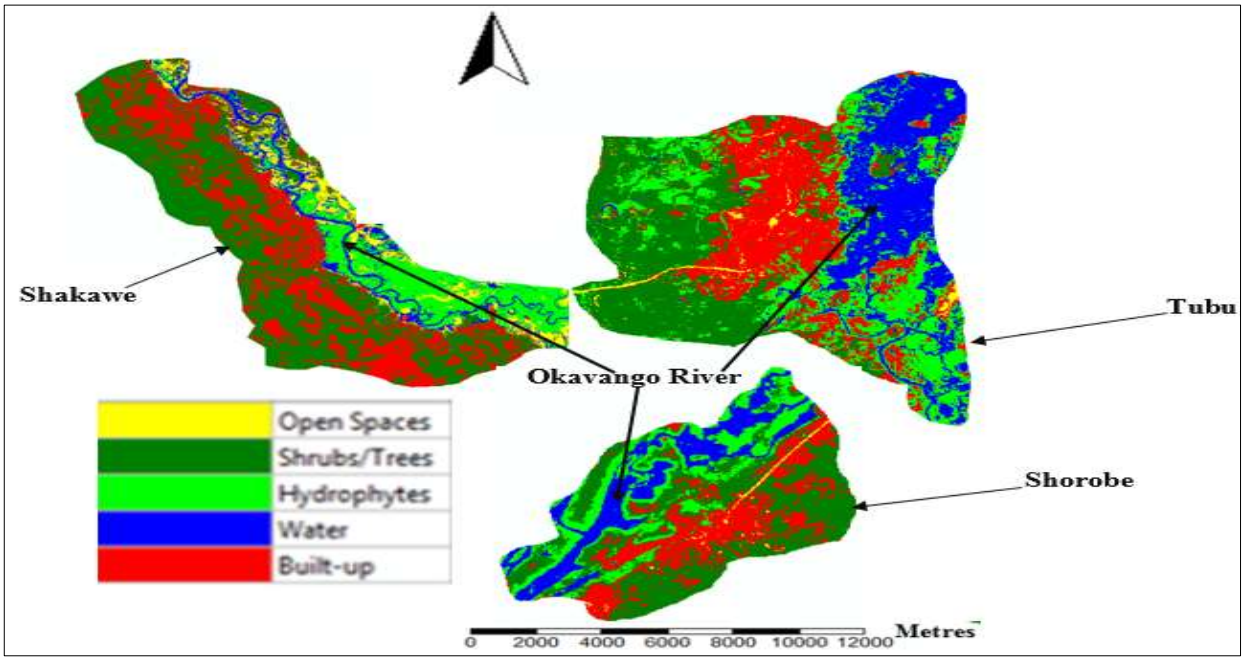

Figure 3. LULC in the study site in 2000.
Source: Author

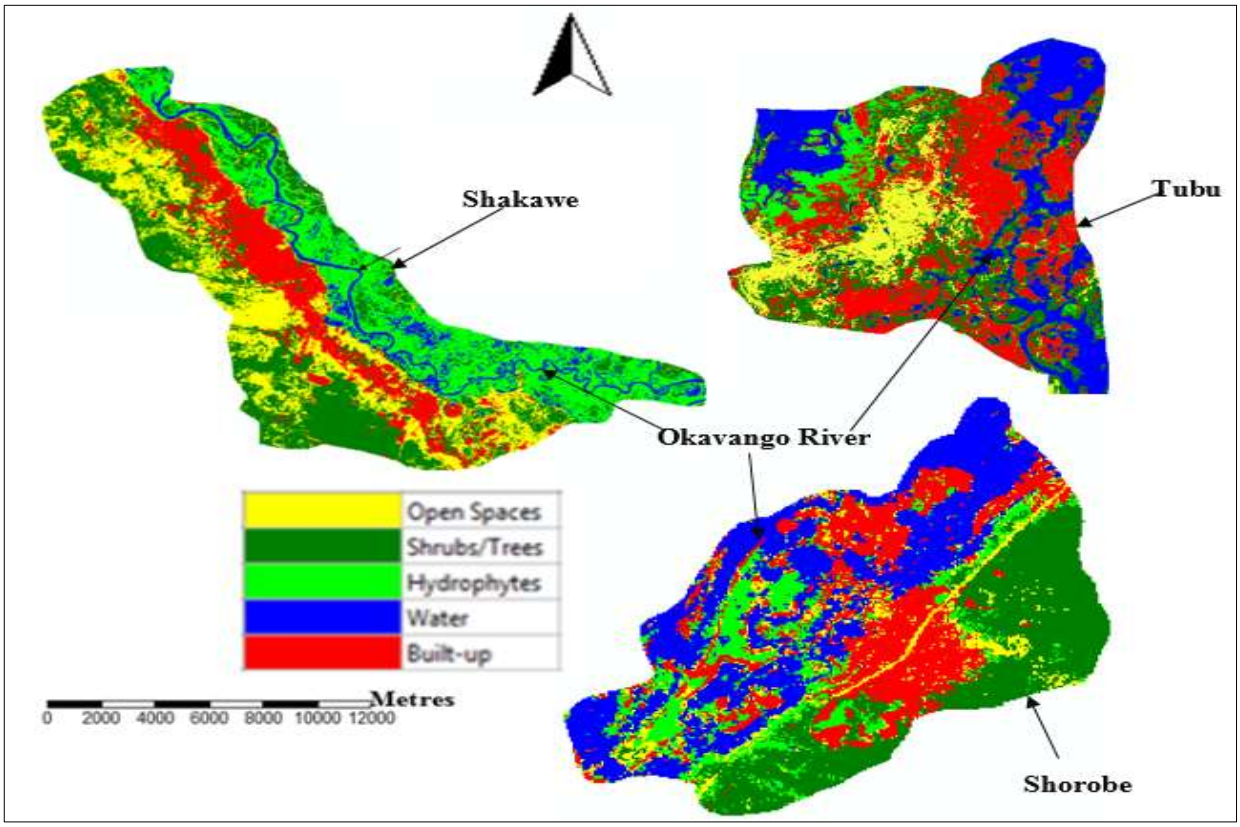

Figure 4. LULC in the three villages in 2010.
Source: Author

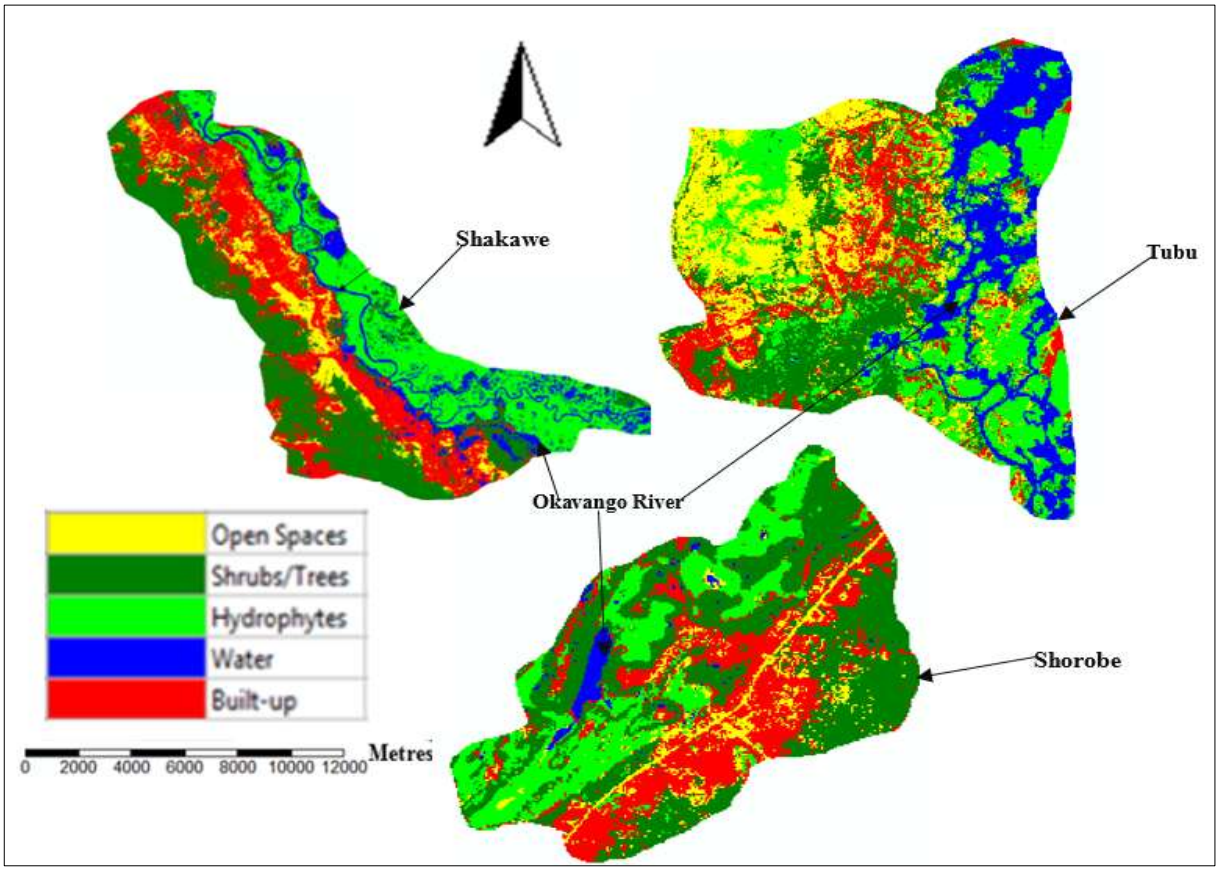

Figure 5. LULC in the villages in 2020.
Source: Author

Table 2. Land use land cover in 2000.

LULC	Tubu	Shorobe	Shakawe
Open spaces	5.5	16	95.9
Shrubs/Trees	65.7	78.3	96
Hydrophytes	3.1	48.8	76.7
Water	10.7	63.2	29.7
Built-up	10.9	52.6	30.7
Total	95.9	258.9	329

Source: Author

Table 3. Land use land cover in 2010.

LULC	Tubu	Shorobe	Shakawe
Open spaces	11.2	20.3	65.9
Shrubs/Trees	23.4	62.9	96.2
Hydrophytes	7	35.8	71.4
Water	25.9	79.3	19.5
Built-up	28.4	60.6	76
Total	95.9	258.9	329

Source: Author

Table 4. Land use land cover in the villages in 2020.

LULC	Tubu	Shorobe	Shakawe
Open spaces	10.1	11.2	57.8
Shrubs/Trees	18.9	45.7	66.1
Hydrophytes	15.0	37.5	27.3
Water	6.7	18.5	28.2
Built-up	45.2	146	149.6
Total	95.9	258.9	329

Source: Author

Table 5. Distribution of respondents by gender (n = 455).

Gender	Shorobe (%)	Shakawe (%)	Tubu (%)	Total (%)
Male	4	25.1	8.1	37.1
Female	9	43.9	9.9	62.9
Total	13	69	18	100

Source: Fieldwork, 2019

Table 6. Distribution of respondents by age group (n =455).

Age group	Frequency	Percentage	Descriptive Statistics
20-29	121	26.6	
30-39	112	24.6	
40-49	85	18.7	M = 42.5
50-59	63	13.8	SD = 16.2
60 +	74	16.3	
Total	455	100	

Source: Fieldwork, 2019.

The distribution of respondents by gender is shown in Table 5 which shows that the least (4%) male respondents were from Shorobe and most (25.1%) of them were from Shakawe. Tubu contributed only 8.1 percent of the male respondents. In total 37.1 percent of the respondents were males.

The highest (43.9%) female respondents were from Shakawe and Shorobe and Tubu contributing 9 and 9.9 percent of the female respondents respectively. In this study, the majority (62.9%) of the respondents were females and males constituted only 37.1 percent.

The findings show that the mean age of the respondents was 42.5 years with a standard deviation of 16.2 years. While the least (13.8%) respondents were within the 50-59 age group, most (26.6%) of them were in the 20-29 age group. The 60+ age group constituted 16.3 percent of the sample and 18.7% of the sample was within the 40-49 age group (Table 6). The 30-39 age group was second from highest constituting 24.6 percent of the sample size.

In terms of ethnicity, the majority (78%) were BaYeyi and the least (6.2%) were HaMbukushu. The BaTawana and BaSarwa comprise 9 and 6.8% of the sample respectively. The findings show that the majority (59.6%) of the respondents strongly agreed (35.4%) and agreed (24.2%) with the assertion that “[T]here are taboos for natural resources management (NRM)” within the Okavango Delta (Table 7). While 8.1% were neutral (U) and therefore decided not to reveal their opinions, 32.3% of them either disagreed (16.3%) or strongly disagreed (16%) with the statement on the availability of taboos for NRM. Concerning “[T]aboos are set and enforced by elders”, the majority (69.2%) of the respondents either disagreed (38%) or strongly agreed (32.2%) with the assertion. The results show that only 20% of the respondent concurred with the statement that “[T]aboos are set and enforced by elders” and 10.8% were neutral and therefore did not share their opinions (Figure 6).

Findings show that 54.5% of the respondents strongly agreed (29%) and agreed (25.5%) that “[S]anctions are imposed on those who violet taboos” (Table 7). While 15.5% of the respondents were neutral, 29.9% of them

Table 7. Respondents' disposition on NRM taboos (n = 455).

Statement	SA (%)	A(%)	U(%)	D(%)	SD(%)
There are taboos for NRM	35.4	24.2	8.1	16.3	16
Taboos are set and enforced by elders	12.1	7.9	10.8	38	31.2
Sanctions are imposed on those who violet taboos	29	25.5	15.6	14.1	15.8
Taboos monitor abuse of NR	34.9	26.6	14.5	11.4	12.6

SA = Strongly Agree; A = Agree; U = neutral; D = Disagree; SD = Strongly Disagree.
Source: Fieldwork, 2019.

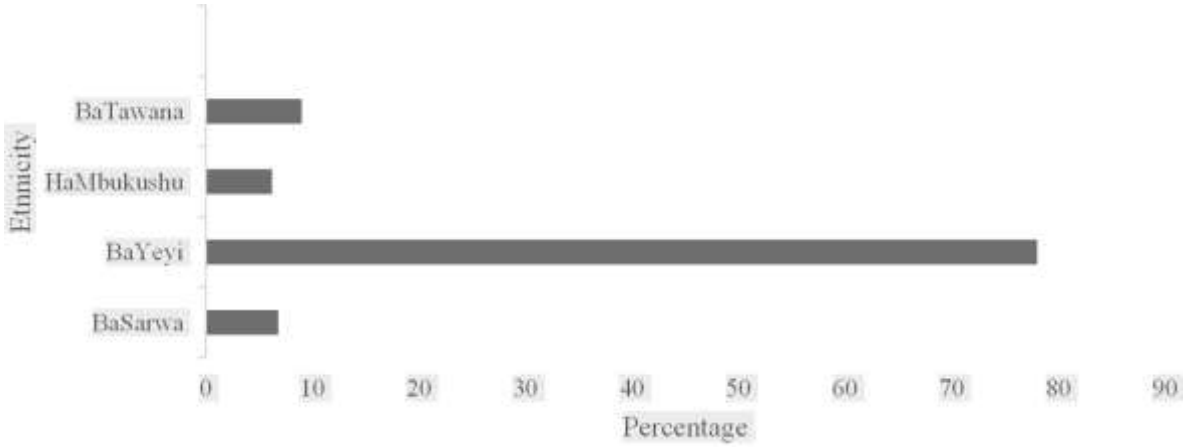

Figure 6. Distribution of respondents by ethnicity.
Source: Fieldwork (2019).

Table 8. Taboos relating to natural resources management.

Taboo	Outcome	Key informants' comment
Cutting down trees	Becomes insane	To avoid soil erosion
Gathering wild fruit for sale	Gets lost	Curbing overexploitation of wild fruits
Entering sacred places	Taken by mermaid	To key ecosystems intact
Fishing in sacred places	Taken by mermaid	To preserve fish breeding areas
Washing in river	Taken by mermaid	Curb water pollution
Streambank cultivation	Taken by mermaid	Curb siltation

Source: Fieldwork, 2019.

either disagreed (14.1%) or strongly disagreed (15.8%). The results also show that the majority (61.5%) of the respondents strongly agreed (34.9%) and agreed (26.6%) with the statement that "[T]aboos monitor abuse of natural resources (NR)". While 14.5% of the respondents were neutral, 11.4% and 12.6% of them disagreed and strongly disagreed respectively.

Findings show that taboos on water, land and vegetation were meant to ensure the sustenance of natural resources. The outcome of violating a taboo was either one goes mad or disappears by being taken by a mermaid (Table 8).

Concerning the question on water creatures regarded as the most important symbol of water, the findings revealed that the majority (52%) of the respondents viewed frogs as the most crucial symbol for water (Figure 7). The least (2%) respondents associated water with the shark (1%) and whale (1%). While 4% of the respondents linked water with fish, 15% of them viewed snakes as the symbol for water in the villages. Crocodiles, seashells and birds contributed 12%, 5% and 10% of the respondents respectively.

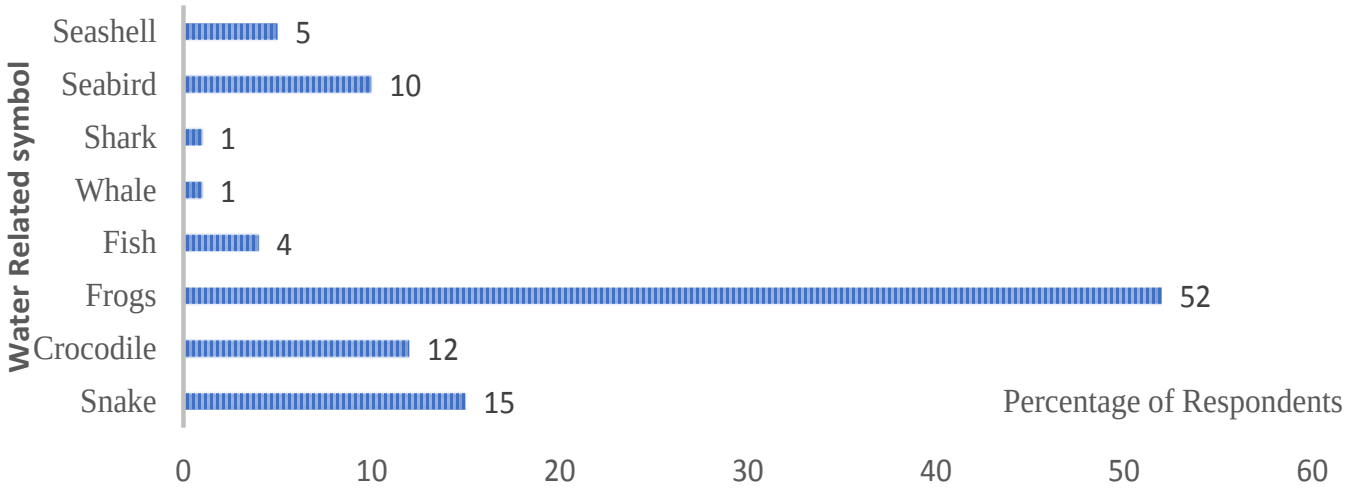

Figure 7. Disposition of respondents on Water symbols (Source: Field survey, 2019).

DISCUSSIONS

The results revealed that the conservation of natural resources in the study area utilised taboos among other indigenous means. A taboo is any ritual prohibition on certain activities which may involve the avoidance of certain places, objects or actions (Mapira and Mazambara, 2013). A personal interview with a key informant revealed that some places were regarded as sacred and were not supposed to be ill-treated by human activities. The key informant had to say, "[a]ny person who enters a sacred place risked disappearing, eaten by wild animals or become insane in the forest". It is important to note that the consequence associated with entering sacred sites might not be true, however, it is equally important to note that such taboos were meant to ensure a harmonious relationship between people and vegetation. Thus, a taboo preventing people from cutting down trees implicitly inform local people to regard vegetation as part of human beings than adopting the homocentric ethics whereby only the welfare of people has intrinsic moral worth (Velasquez and Rostankowski, 1985). In this way, taboos were a way to protect vegetation and land resources against possible anthropological damage. Consequently, land and vegetation were kept in their natural state for centuries without being degraded by human interference. An analysis of the taboos to conserve vegetation, in general, revealed that taboos were protecting fruit trees, medicinal as well as those trees along watercourses. Fruit trees were regarded as home for the ancestral spirits. During an FGD one elderly man had to say, "[t]rees and water bodies are the dwelling places of our ancestors and therefore should not be cut and polluted". This finding is similar to the results of a study by Sarfo-Mensah and Oduro (2007) on the role of customary rules in the management of natural resources. The study found that elderly people in Ghana believed that spirits and gods of their area live in trees and pools of water and in turn, no one is permitted to cut trees and make the water dirty. Thus, taboos were enshrined in religious and cultural beliefs and were enforced by prohibition. It is noteworthy that while taboos had no legal backing, they are so strong that local people obeyed them.

A study by Codjoe (2007) in Ghana on LULC also produced five classes and showed that people used taboos in the conservation of resources. Land and vegetation are crucial assets and means to sustain livelihoods especially in indigenous communities (Codjoe, 2007). In wake of the rapidly growing population, increase in technological capacity and affluence in the Okavango Delta, the land cover was transformed since 2000 as indicated in the maps in Figures 3-5. The decline in vegetation cover is attributed to the increase in human population which demand more space to build houses. As more shelter was constructed more vegetation cover was cleaned as result. This implies that sacred places were cleared of vegetation cover and people could no longer regard such places as sacred. This concurs with Das et al. (2020) who opine that competition for space results in people utilising sacred places with the consequence of the sacredness of such places being undervalued.

Across various cultures, the frog serves as a symbol of water, usually associated with the local deity (Akpabio, 2012). Literature has shown that the association between water and frogs has developed independently in many societies rather than being a result of outward diffusion from a single cultural source (Drewal, 2008). Like in other cultures as noted in the literature, water is a valuable

resource in the study area. Besides being crucial for human beings, water is also important to nonhuman beings such as vegetation and animals. Thus, the findings also revealed that there were taboos relating to the management of water resources.

It is noteworthy that the belief system in the local communities in Africa and perhaps elsewhere prioritise utilisation of indigenous to western science. Thus, the results of this study point to the fact that the belief system of the people within the study area can protect natural resources and the environment in general if the local people have an interest in them. Based on Shastri et al. (2013)'s study indigenous communities use their indigenous knowledge to observe environmental ethics that help in regulating their interaction with the natural environment. Through indigenous knowledge, local people in the OD have vital cultural practices and belief systems that are environmentally friendly and sustainable, thus, contributing to natural resources sustainability. A discussion with key informants as well as heads of households shows that local people hold the ascription of supernatural powers to objects. This concurs with Rim-Rukeh et al. (2013) who reiterate that the local communities' belief system lies in the abode of the gods located in water, vegetation and land and such belief system is respected by the local people. Like in Ghana indigenous knowledge is the prime factor guiding people's conduct towards the exploitation of natural resources in the study area. A key informant had this to say about the role of western science in the management of natural resources: "*Western science in the form of Christianity and modernisation has worn away our indigenous knowledge and belief system in the management of natural resources*". A further probe to understand how western science has helped in the erosion of indigenous knowledge the key informant had to say: "*Our knowledge system is eroded through acculturation of local people especially through the introduction of Christianity and the sudden rise of the tourism industry in the Okavango Delta".* Culture is not static but is ever evolving and all traditions and beliefs are likely to be changing over time. As people in the Okavango Delta reflect global trends of increased movement and communication between communities such change is expected to accelerate. The key informants thus were worried about the migration of people in and out of the Okavango Delta and thought that the degree to which rules and regulations bordering natural resources management are respected is to a greater extent influenced by western science than with the indigenous knowledge. Therefore, the findings of this are like the findings of a study conducted by Lingard et al. (2003) who found that migration of people has a propensity to dilute the local culture. Thus, many people perceive foreigners as immune to local rules and norms, but once they are regularly broken, local adherence is also likely to reduce. In this regard, people who at first are reluctant to break the taboo soon do so willingly.

The adoption of other religions outside the African Traditional Religion (ATR) was also noted as the reason why the importance of local rules was losing value in the study area. An informal interview with the elders revealed that local rules were no longer effective as their efficacy in the management of resources were altered with a change of time. The elders bemoaned that several people especially the youths and foreigners knowingly break the rules because they regard them as baseless. From the informal interview with the local elders, it was noted that modern forms of education together with foreign religions influenced the current degradation of local rules in the management of resources especially concerning compliance to taboos. Thus, from the perspective of the elders, it is the current forms of education that diminish the belief in the importance of taboos. It was also revealed that elders complying with foreign religions could not transmit TEK to their children. This was particularly common amongst people who were non-indigenous to the Okavango Delta. Despite the rebuffing of local rules by the educated young generation, the old generations regarded taboos as very relevant in the management of natural resources. The study revealed that water continues to hold several meanings that serve to highlight the human natural phenomenon nexus. From the results, two interconnected issues were emphasized. On the one hand, perceptions and engagements with water in the study area were shaped by spiritual insights and on the other hand, such wisdom borders on the existential matters which necessities need for cultural regulatory practices such as taboos, norms and values in the utilisation of natural resources. This is because water personifies godness and local people regard it as therapeutic as well as life (Bowles, 1993; Gondo et al., 2020). Such a belief is in line with Lingard et al (2003) who opine that the knowledge of water conservation is shaped by contexts of the cultural and social factors.

Since pre-colonial times, IKS in natural resources management has been part of Africa's heritage. IKS aims to address local challenges bordering natural resources utilisation and management. This form of knowledge is locally oriented and has stood the test of time (Akena, 2012). However, western science which is packaged in the form of western education and religion has destroyed or marginalised the desirable IK and replaced it with western knowledge and approaches (Mapira and Mazambara, 2013). In line with Mapira and Mazambara (2013) the position of this paper is that local people in the Okavango Delta were concerned about their belief system which has perpetuated Okavango Delta and its environments in a pristine state for centuries. This implies that no one could mismanage the natural resources and environmental settings for centuries. Based on the

participant during FGDs, “the *punishment that was in place for people who mismanage natural environment was so severe that local people were mindful of the utilisation of the available resources*”. In this regard, certain areas such as forests, water points and rivers were revered and therefore sacred to be abused. The belief system has to a larger extent contributed to natural resources management and has also played a key role in ensuring that people who broke rules and norms are punished. However, on the contrary, western science and its devotees argue that the reason why local communities in Africa and elsewhere in the developing countries did not develop is that they are living in primitive environments and lack innovative thinking, technology and the ability to advance (Weiss et al., 2013). It is noteworthy that whether indigenous people and their knowledge live in ignorance at least they need to be given applause for leaving the Okavango Delta and its locality undestroyed for prosperity. In this regard, the positionality of this paper is that sustainable equitable and efficient management of natural resources requires a firm commitment to institutional pluralism. This approach emphasises the joint utilisation of WS and IKS in the management of natural resources. It is from this vantage point that it is argued in this paper that while WS is vital in the management of resources, there is also IKS which is equally important in the management of natural resources. This is in line with the institutional bricolage theory which acknowledges the existence of more than one institutional arrangement at the local level and which can generate and enforce rules. Based on the interview with the key informants as well as interactions with local people during FGD, western science through formal education and Christianity have a lot to blame for causing undesired alterations to natural resources in the OD, Botswana and perhaps in Africa. This concurs with Diawuo and Issifu (2015) who also regards western science as the major contributor in changing local people’s belief system. Also, Appiah-Opoku and Hyma (1999) reiterated that before colonisation indigenous people entrusted all-natural resources management in their belief system. Thus, before colonisation elders and chiefs occupied a unique position in the management of natural resources. They were accepted by their people as the custodian of religions, spiritual embodiment of their communities with the responsibilities of managing and holding the trust of both natural resources for the dead and the living.

Conclusion

The study aimed at mapping land use and land cover changes and comprehension of traditional ecological knowledge in natural resources management in three villages within the Okavango Delta. Five land use and land cover were generated for a ten-year interval from 2000 to 2020. Evidence from the thematic maps revealed a reduction in vegetation cover and an increase in the built-up area. Findings also reveal that preference was given to WS than indigenous knowledge systems. This is despite that sustainable management of resources is better achieved through the utilisation of both genres of knowledge systems. It has been noted that traditional ecological knowledge is vital in natural resources management and the study calls for the inclusion of this type of knowledge in NRM. This is because traditional ecological knowledge is peculiar to the local area and it saves the needs of the locals ultimately their natural resources. The study recommends an in-depth study of the symbols bordering rangelands and water in various ethnic groups. It is also recommended that policymakers need to ensure that traditional ecological knowledge forms part of the education system within the country. Thus, there is a need to include TEK in primary, secondary and tertiary education curricula within the country.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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In their own voices- understanding GBV in Zimbabwe: Evidence from a survivor's perspective

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Gender based violence against women is a prevalent public health challenge that poses a serious threat to women's physical, social and mental health. Zimbabwe has taken proactive and reactive steps to deal with gender-based violence (GBV) through legislation and policies. Despite this seemingly conducive environment 1 in 3 women continue to experience GBV in Zimbabwe. While sustained research in the country indicate the risk factors associated with GBV that are driven from population surveys, few details survivors' narratives and insights into this type of violence. This paper provides unique accounts of two women's experiences in an abusive relationship as well as perspectives to better understand complexities and pervasiveness of GBV.

Key words: Gender based violence, coping strategies, physical violence, and emotional violence.

INTRODUCTION

Broadly construed as violence against a person because of their gender (EIGE, 2021), gender-based violence (GBV) continues to be one of the most notable and grave social human rights violations that occurs within all societies (United Nations, 2015; Eldoseri and Sharp, 2017; EIGE, 2021). Although people of all genders experience GBV, the majority of victims are women and girls. While studies have shown that the drivers of GBV are multiple, pervasive and complex (Heise, 1998; Fleming et al., 2015; Sida, 2015) gender discriminatory norms and unequal balance of power between girls, women boys and men in patriarchal societies are the overarching root causes. It poses a serious threat to women's mental and physical health including depression, suicide and self-harm, chronic physical pain. Gynaecological problems, femicide and post-traumatic stress disorder among other adverse health outcomes (Dillon et al., 2013; Satyanarayan et al., 2016).

In Zimbabwe studies have shown that GBV affects the health of women and girls physically, emotionally and psychologically (Mashiri, 2013). According to the Zimbabwe Demographic Health Survey (2015) physical violence is the most common form of GBV in Zimbabwe. Women and girls continue to be physically, sexually and emotionally abused despite the country having a comprehensive multisectoral legal and policy framework that mandates institutions like the police and health sectors to come up with strategies and interventions to prevent GBV. For example the police established the victim friendly unit (VFU), a separate department in the police force that deals exclusively with GBV issues. To buttress the legal environment, the country has national

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legislation like the Domestic Violence Act of 2006, the National Gender Based Violence Strategy (2012-2015), and the ratification of relevant international and regional instruments such as the CEDAW; the Beijing Declaration and Platform of Action; Protocol to the African Charter on Human and Peoples Rights on the rights of Women in Africa; the SADC Gender Protocol; the United Nations Convention on the Rights of the Child; the Plan of Action of the International Conference on Population and Development; and the Sustainable Development goals, among many others.

Studies on the causes of GBV (Saffitz, 2010; Abramsky et al., 2011; Fulu et al., 2013; Fleming et al., 2015; Fidan and Bui, 2016; Finley, 2016; Farver and Hamieh, 2016) and effects (Lang et al., 2011; WHO, 2013; Wagman et al., 2015; Shamu et al., 2013; Decker et al., 2014) are vast and cover both low and high income countries. However these are from nationally representative samples and are often perception studies. These lack the narratives of GBV survivors which give real accounts of their experiences at the hands of the perpetrators, how they are treated by service providers and law enforcement institutions like the police. Real experiences of GBV survivors are crucial not only in understanding the nature of GBV but also can be the basis of context specific intervention strategies. The following narratives offer unique and insightful experiences of GBV victims in Zimbabwe.

METHODS

The researcher approached an organization that offer temporary accommodation to survivors of gender based violence as well as offering skills to improve their livelihoods. At any given time the organization has different categories of survivors that include the traumatised and those who have received counselling, are undergoing training and have reached a certain level of emotional stability. Among the emotionally stable survivors two women were purposively identified and consented to give narrations of their experiences. The two received pre-counselling to reduce the chance of bad memories degenerating into distress.

Data collected was confidential and personal to identify information not solicited from the two selected survivors. During data collection arrangement to send the survivors to the counsellor were made in case the survivors 'break' during the interview. However all the survivors managed to go through their interviews without showing signs of distress? The survivors were made aware that their narratives might be published and they consented to this effect by signing a consent form. The study was approved by the Medical Research Council of Zimbabwe (A2379). The survivors in question were approximately 30 years of age and not formally employed.

FINDINGS

The experience of Sarah (not her real name)

I was married for ten years and I have two children from the marriage. It all started when I gave birth to my first child. He would come home late around 12 midnight or in the early hours of the day.

Whenever he arrived he would ask me to cook. He was against the idea of reserving food for him as he wanted 'fresh food'. It was difficult, given the fact that I wake up at 4 am and go to the market to buy tomatoes and vegetables for resell at my place near the road where I stay. At times having cooked the sadza he would not eat saying 'I don't eat sadza with vegetables'. He would shout at me accusing me of not being resourceful in order to buy meat.

During weekends he would not come home. Upon seeing him on Friday morning I would see him on Sunday evening. It became a norm for the greater part of our marriage. Asking him where he was would invite beatings. When I did not ask he would be angry at me for not asking and at times beat me for that. It was difficult.

I used to report to my aunt (sister of my husband) who at first encouraged me to soldier on. Seeing the frequency of the beatings she used to talk to him but he would temporarily change. He would be a good person for a couple of days before starting again to disappear during weekends. I never knew how much he earned. At the end of the month he would buy the basics like sugar, mealie meal, soap and flour and on daily basis I had to ask for money to buy relish. At times he would provide but at times quarrels started when I asked about money.

On many occasions he would beat me and I used to go to the hospital for treatment. I used to lie that I got hurt working in the garden but the health workers were often suspicious. One day he beat me and I decided to kill myself by drinking poison. I did not know what happened next but I found myself in the hospital. While at the hospital I learnt about (name withheld) this organization and I decided to come here after the treatment. My parents were against it as they said it will constrain my marriage. I stood my ground as the marriage was already constrained. The organization helped me to apply for a divorce and it was successful. At the moment I am receiving training on how to run small businesses and I hope to continue with my life.

The experience of Brenda (Case 2 not her real name)

I got married when I was 21 years and this is my fifteenth year in marriage. It is a marriage characterised by verbal insults, beatings sexual coercion and intimidation. My husband is a taxi driver and when at home he is always on his mobile cell phone. His cell phone is part of him and one day he left it while he was bathing. An alert indicating that a message has been received, caused me to get hold of the cell phone and simultaneously before I read the message he grabbed my hand forcibly taking the phone. That day he was furious at me and I was thoroughly beaten. He warned me not to touch his phone and never to answer any incoming calls.

During weekends he usually calls to report that his

vehicle has broken down or that he is in a fuel queue. Strikingly he would say so consistently on Fridays or Saturdays and I suspected he would be at a 'small house'. I am afraid of contracting HIV. He is the kind of a person with extremes- he would beat me and after that either asks for forgiveness or sex. On many occasions he would demand it (sex). The idea of being beaten and shortly after being intimate to him is devastating.

One day he came drunk and started accusing me of having boyfriends. He said men are seen loitering at the place where I sell vegetables and potatoes and tomatoes. He started to beat me and I escaped with my child and went to the police. The police decided to offer counselling to him after cautioning him and decided to refer me to this place. This is the reason why I am here and I hope it will work out…..

DISCUSSION

The two survivors of GBV describe their experiences of this type of violence demonstrating that GBV is fuelled by both rigid social norms as well as modernization attributes like social media. Sarah's experience show that various acts of GBV start with unusual behaviour. The husband would come home later at night and ask the wife to cook for him. She indicated that he was against the idea of her preparing the food in advance and that this behaviour started when she gave birth to her first child. In Zimbabwean culture married women are supposed to physically serve food to their husbands at any time of the day. This practice is centred on unequal power relations between men and women and is exacerbated by payment of lobola. Having paid lobola (or part of it as is the norm) many men in Zimbabwe treat their partners as slaves and as sex objects.

The husband would ask Sarah to cook food and having put all her effort to do it sometimes would not eat it. In the narratives accusations are made and the intention is to stretch the women's patience. The shouting and non-eating of food constitute emotional violence which is the second form of GBV in Zimbabwe after physical violence (ZIMSTATS and ICF, 2016). Emotional violence is a product of actions, harsh words and the way women are disturbed from their sleep. Emotional violence is a sensitive, harrowing debilitating marital issue that affect 1 in 3 women in Zimbabwe despite the presence of legislation to curb GBV. However in Zimbabwe emotional violence is not recognised by the Domestic Violence Act (2007) and this leaves women with limited options to address the situation through the traditional arrangements.

From arriving at midnight the husband extended the time to coming home after three days. Sarah described a desperate situation and dilemma where she would be beaten for asking his whereabouts as well as for not asking. Research has shown that women's responses to GBV are shaped by the circumstances of the abuse (Abrahams, 2005; Ruhi, 2010). Sarah opted to keep quite as well as engaging her husband. Keeping quite is less confrontational, covert and engaging the husband has the potential to ignite physical violence. The selection of the coping strategies by women reflects the existing cultural, social and economic conditions in any society. Research in India has shown that women used strategies like silence, unspoken confrontations, hiding, talking back and contemplating suicide (Abraham, 2005).

Women strategically find a way within the cultural, social and economic and structural environment to respond to GBV. While, they often do not always succeed on their effort to empower them in building resilience against GBV. This explains why many women in Zimbabwe stay in abusive relationship for the greater part of their married life.

As a result of physical violence the survivors sought help from the relatives and disguised the violence at the clinic. The survivor wanted to preserve marriage at any cost. Marriage is an important social achievement not only for the women but for her biological family and those not married are often regarded as social outcasts. Keeping this reality in mind, the survivor adopted strategies that preserve marriage. However marriage as a private domain is likely to curtail reporting thus complicating efforts to curb GBV as well as perpetuating this type of violence. Although marriage is a critical socialization institution, it can be a breeding ground for future violence. Research has shown that men who perpetrate violence are more likely to have witnessed parental violence in childhood (Fleming et al., 2015). This is because children learn behavior from their experiences and observation of social interactions. These observations have an impact if the modelers are of high status like parents and caregivers. As a result, when children experience GBV they learn that violence is acceptable and can later use it in their lives (Gomez, 2011; Hamby et al., 2012). The intergenerational transmission of violence has been found to be a risk factor for both engaging in GBV and for victimization (Barrett et al., 2012). Marriage as an institution facilitates the transmission of violence covertly and overtly.

Overall, studies in middle low income countries have shown that those who had witnessed parental violence when they were young are likely to be perpetrators of GBV, to hold permissive attitudes towards use of violence against women, and to consider women to be of less value (Speizer, 2010; Fleming et al., 2015).

The results show that survivors of GBV can change their emotion based on coping with strategies to problem of focused coping strategies. Emotion focused strategies seek to manage the situation by using techniques that modify emotions while problem focused on coping strategies use observable techniques to address the challenges (Shannon et al., 2006). From an emotion focused strategy perspective the survivor tried to conceal

violence at the clinic thus sweeping things under the carpet or denying the problem. From the narrative it is clear that family pressure and economic dependency were the factors that initially discourage the survivor from leaving the abuse relationship. The persistent of physical abuse and the survivor's exposure to public life (hospital and civic organization) shaped her desire to leave the abusive relationship. Being aware of where and how to get help when abused is key for women to choose strategies to escape violence.

The narratives by Brenda presented a complex picture of GBV in which intimidation; unequal power relations as well as modernization (measured by use of social media) can fuel this type of violence. Extra marital relationships are potential causes of GBV and these are often exposed by social media. In patriarchal societies married are confined to private life but become aware of what happens in the public life through social media.

In the era of multimedia environment use of cell phones to make bank transactions and to communication (messages and pictures) has the potential to expose information that can increase tension between men and women. WhatsApp conversations can expose extra marital relationships in marriage or the existence of another relationship to those dating.

What used to be private is increasingly becoming 'public' because of cell phone use thus increasing the risk of perpetrating or experiencing GBV.

Results show that emotional abuse comes in many forms and usually emanates from fear, denial, coercion and intimidation and after an incident of physical or sexual assault that results in injury the perpetrator may use this experience (injury) to intimidate his spouse (Mashiri, 2013). Furthermore, male partners can be excessively jealous of their sexual partners and restrict them from visiting their relatives, deciding the types of friends one has to relate with and going through mobile phones checking history of chats and calls. In Zimbabwean culture this excessive jealous or 'kuchengera' is a key determinant of emotional abuse. The victims are often blamed for offenses, which they did not commit, and this tends to be psychologically damaging.

The Shona and the Ndebele cultures which are predominant in Zimbabwe condone multiple sex partners for men and the constant fear of contracting HIV by the married women contribute to emotional abuse. Unequal power relations within marriage compromise women's ability to negotiate safe sexual practices and due to cultural and social norms women are supposed to be silent, submissive and conform in sexual relation. In addition, economic abuse can contribute to emotional abuse when the male partners as the breadwinner fail to take care of their families. Financial resources could be channeled to 'small houses' a phenomenon that is increasing in Zimbabwe. Small house is when a husband has another 'secret' family besides the official one that is often neglected. The small house phenomenon is common among older couples and this may result in aging women being starved of both sex and financial resources.

The link between economic and emotional abuse confirm other studies which showed that women rarely experience one type of violence (Scott-Storey, 2011; Ansara and Hindin, 2010; Cavanaugh et al., 2012).

Demonstrating lack of sensitivity and care Brenda's partner would beat her and force her to be intimate with him. This form of marital rape is psychologically damaging. To those who experience marital rape in Zimbabwe, discriminatory attitudes and practices of authorities place barriers in women's access to justice. The prosecution of marital rape (which has a bearing on the levels of sexual abuse in Zimbabwe) requires the consent of the Attorney General (AG) (Social Institution and Gender Index 2014). The AG assesses if there is reasonable evidence to justify the process of prosecution taking into account the issue of conjugal rights and the cultural situations. This means that the survivor is not in control of the legal process after she has been raped and such a situation inhibits reporting. Furthermore entrenched institutional and societal attitudes that deny marital rape as a form of violence against women also prevent women from reporting thus contributing to perceived low rates of sexual abuse. Reporting spousal rape is also curtailed by lack of awareness that marital rape is a crime, police reluctance to be involved in domestic disputes and the bureaucratic hurdles like the process of applying to the AG for consent. Police reports and courts records are important sources of sexual abuse data and their action has a bearing on the reported levels of this type of violence.

The Zimbabwean society masks marital rape through the payment lobola, which gives men a sense of ownership over their wives. Currently lobola has been commercialized, that is exorbitant prices are demanded by parent thus cementing the ownership mentality by men. Even those who are cohabiting by paying rent, school fees, buying food and other gifts men tend to have a sense of ownership of women they stay with. The sense of ownership makes men to demand sex whether the woman is sick, tired or on menstrual cycle. Cohabitation and marriage are sexual relationship in which it may be difficult to report rape and more so to prove it competently in the courts of law. As a result of cultural norms that promote secrecy around sexual issues, economic dependency of women and children on men and the stigma associated with rape there is a gap between what is reported and what is happening on the ground. A sizeable number of women and girls are abused sexually daily in Zimbabwe but the reported rates points to the contrary.

The story of Brenda demonstrated the link between use of alcohol and GBV. The false accusations made indicate that GBV can be a premeditated crime in which alcohol

can be blamed as a scapegoat. However research has established relationship between alcohol abuse and GBV (Abbey et al., 2011; Thompson et al., 2015). Alcohol tends to affect people's perceptions and judgement and this interact with a complex set of social and psychological factors to fuel GBV (Flake, 2005). Generally drinking especially heavy drinking is associated with unruly behavior and diminishing morals as well as lack of respect for both self and others. As a result, they are at a greater risk of developing sexually and physically aggressive behavior than men who drink in small quantities (Abbey et al., 2011). Use of alcohol impacts one's cognitions and is associated with over perceiving of sexual interests and a diminishing ability to read social cues. For men the combination of alcohol use, hostile masculinity and perceived approval of use of violence as a conflict resolution strategy, increase the risk of GBV perpetration.

Aware that the police can help, Brenda reported the case to the police who decided to take the non-legal route to solve the problem. The temporary physical separation between the survivor and the perpetrator creates anxiety for both of them if they are in an intimate relationship. This may explain why she concluded her narration by "I hope it will work out." Research has shown that police intervention do not always prevent relationship continuation and deter future violence (Bonomi et al., 2011; Sloan et al., 2013). Therefore, instead of navigating the complex legal route pathway, victims opt for the non-legal route, which help to preserve the family relations. Police interventions especially using the legal route has the potential to ignite further abuse if the abuser 'wins' the case. Furthermore, the legal route requires 'continuity evidence', which can be difficult to sustain when lawyers confront the police officer. Continuity of evidence refers "to the ability of the investigator to honestly and accurately testify in court that physical evidence being presented is in fact the same item as the original…" (UNODC, 2010).

The two narrations documents how women experience GBV in the face of their subordinate and powerless positions in patriarchal societies like Zimbabwe. The women do not only suffer in silence but used a combination of strategies to cope with violence. Nonetheless due to rigid social and religious norms that condone violence, the country's efforts to curb GBV are in vain. Zimbabwe has a powerful civil society institutional set up like the police as well an elaborate legal framework to deal with GBV. Despite this seemingly conducive environment to fight this type of crime laws alone cannot effectively help the abused women. Zimbabwe lacked a proactive institutional response backed by the media which should facilitate the process of women empowerment. The causes of gendered discriminatory norms and unequal power relations between men and women in patriarchal societies like Zimbabwe are the root causes. Only empowered women can challenge repressive patriarchal system in Zimbabwe.

Limitations

While the cases may not be representative of all women experiencing GBV in Zimbabwe or anywhere in the world they do provide insights into the pervasiveness of nature, causes and effects of GBV. The cases demonstrate that GBV is highly contextual and generalization tends to simplify real issues of this type of violence. The cases portray the experiences of the two survivors and therefore may not be generalized to population of women who experience GBV in Zimbabwe.

Conclusion

GBV especially physically and emotional violence are increasing in Zimbabwe despite the presence of a legal framework to curb this type of violence. Reported cases of GBV are low in societies whose women strictly subordinate themselves to men. However globalization ushered many women in the public life where they are exposed to employment, human rights, social media and ways in which they can escape abusive relationships. Thus globalization tends to weaken the traditional patriarchal advantage enjoyed by men. The perceived lack of power by men, results in resorting to the use of force to heightening GBV in Zimbabwe. Furthermore, GBV now consists of many highly diverse sets of actions and behaviors (beating, use of harsh words, searching of women's phones) with significant health implications that can only be addressed with great sensitivity and care. The narratives in this paper provides invaluable information about the pervasive nature of GBV and gaps in prevention efforts. Studies that narrate why perpetrators commit this crime and how survivors cope with it are necessary to develop an evidence based program to curb GBV.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Greater horn of Africa's dilemma in achieving sustainable development goals

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This study assessed the performance of the Greater Horn of Africa (GHA) regional states regarding their respective implementation of the 2030 Agenda for Sustainable Development Goals (SDGs). It examines the successes, challenges, and alignments to national policies and development plan to meet the 2030 agenda and suggested recommendations for accelerating the implementation of the SDGs. This study is a pursuit against the background of the negative impacts of COVID-19. The region is trying its best, but many gaps and limitations to their efforts still stand in their way. This study proposed concrete recommendations to inform policy design and strengthen partnerships between the governments and donors in ensuring that the GHA gets back on track regarding meeting the 2030 Global Agenda. The region's countries fall among the world's poorest countries, save for Kenya, which is becoming a middle-income country. The Greater Horn of Africa is home to eight countries: Kenya, Ethiopia, Uganda, Djibouti, Somalia, Sudan, Eritrea, and South Sudan. They are pursuing implementing their country's development plans, 2030 Visions, IGAD strategic regional objectives, and the A.U. Agenda 2063, in line with their commitment to achieving the Sustainable Development Goals by 2030. This study analyzed the voluntary national reviews of five countries and their national development plans and other reports produced by independent agencies, institutions, and scholars to assess the level of progress, challenges, and breakthroughs as far as the global goals of the 2030 agenda are concerned. GHA is lagging and off-track as far as poverty and hunger eradication is concerned. To make it worse, most of its population still lives below the poverty line, struggling daily to make ends meet. This is because of many underlying causes, including leadership deficiency, the absence of strong institutions, and low production levels. However, job creation is failing to raise the living standards due to low family disposable incomes due to unemployment.

Key words: Sustainable development, off-track, agenda 2030, A.U agenda 2063, low-income countries, lower-middle-income countries.

INTRODUCTION

The Global Agenda 2030, known Sustainable development Goals, were adopted by global leaders in 2015. These goals were a universal call to end poverty, protect Earth's planet, and ensure that all people enjoy peace and prosperity by the end of 2030 (UNDP, 2022). This world's ambitious agenda came up with 17 SDGs afterward; most less developed countries could not achieve the 8 Millennium development goals. Goal 1:

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End poverty in all its forms everywhere. While the number of people living in extreme poverty dropped by more than half between 1990 and 2015 from 1.9 billion to 731 million, too many are still struggling for the most basic human needs. Eradicating poverty in all its forms remains one of humanity's most significant challenges, but its fundamental once achieved. The progress made for four years was erased by Covid-19 and further derailed by the war in Ukraine (UN, 2022).Goal 2: Zero hunger; that is, end hunger, achieve food security and improved nutrition and promote sustainable agriculture. Ending all forms of hunger and malnutrition by 2030 will ensure that all people – especially children – have sufficient and nutritious food all year round and will require promoting sustainable agricultural practices such as supporting small-scale farmers and equal land access, technology, and markets. The number of people that goes hungry and suffer from food insecurity gradually rose between 2014 on the onset of the COVID-19 pandemic. The war in Ukraine is further disrupting global food supply chains and creating the most significant global food crisis since the Second World War.

The Greater Horn of Africa (GHA) is home to eight countries: Kenya, Ethiopia, Uganda, Djibouti, Somalia, Sudan, Eritrea, and South Sudan. Geographically, GHA covers about 5.2 million square kilometers, 30% of which is arable land, and 70% is arid and semi-arid land. It also has about 69,602 km of coastline along the Gulf of Eden, Tadjoura, the Indian Ocean, and the Red Sea. This has endowed it with sea transport and fishery development potential. As far as socio-economic status is concerned, the region has approximately 271 million people. It occupies 21% of Africa's land mass (Schmidt-Traub, 2015). Agriculture, pastoral and agro-pastoral activities form the region's economic bedrock, susceptible to drought and environmental degradation (Eve Mothe, 2018).

Many of these nations are pursuing the implementation of their country development plans, 2030 Visions, IGAD strategic regional objectives, and the A.U. Agenda 2063, in line with the commitment to achieving the Sustainable Development Goals (SDGs) by 2030. They hope to achieve the latter by aligning their pursuits to these development frameworks and other sector-specific regional, continental, and global development frameworks.

This paper mainly discusses five countries (Ethiopia, Kenya, Uganda, Somalia, and Djibouti) out of eight that make Greater Horn Africa (GHA). These countries have aligned their national development plans to the 2030 global agenda.

Three of them have presented their National Voluntary Reviews (NVRs) reports more than once. In contrast, Somalia and Djibouti presented their VNR reports this year (2022) at the United Nations High-Level Political Forum (HPLF). As a result, each country has shown some significant improvement though still far off track.

Peace, diplomacy, and international cooperation are fundamental conditions for the world to progress on the SDGs as we move toward 2030 and beyond. The protracted wars and conflicts such as the Ukraine war and other military conflicts are humanitarian tragedies that impact negatively on prosperity and social outcomes throughout the rest of the world, including exacerbating poverty, food insecurity, and access to affordable energy as the climate and biodiversity crises amplify the impact of these cries (Jeffrey et al., 2022). Various programs have been initiated under the auspices of the IGAD Strategy 2022 to 2025. They include Drought Resilience and Sustainable Initiative (IDDRSI); Regional Comprehensive Africa Agriculture Development Programme (CAADP) Compact; Institutional Strengthening Action Program (ISAP); Agriculture, Livestock, Fisheries, and Food Security; Natural Resources and Environment; Peace and Security; Gender Affairs; and other strategies and policy papers (Population, n.d.).

In the last decade, the region registered over a 5% increase in economic growth against an increasingly young population, of which 70% are under 35. The achievement was effectively nullified by the high pressures exerted on the economy by the large percentage of young people. Most youth graduating from training and education institutions come to the labor market, which is already saturated; hence with no job opportunities, they find themselves unemployed. This has caused unemployment, food insecurity, and environmental stress resulting in environmental degradation. Climate variability has rendered the region vulnerable, as a large proportion of the population has been food insecure (Schmidt-Traub, 2015).

Serious challenges are causing most GHA countries to perform poorly. None of them has scored convincingly on the 17 Sustainable Development Goals because they struggle to tackle internal challenges and inequalities. Out of the 17 SDGs in general, SDG 3 (Good Health and Well-being), SDG 9 (Infrastructure), and SDG 16 (Peace, Justice, and Strong Institutions) face the most significant challenges. Most of the countries in the GHA are off-track as far as SDG 1 (No Poverty), whose headcount ratio at $1.90 /day was about 15% in 2020. Concerning SDG 2 (Zero hunger), the prevalence of undernourishment was about 30%, on average, in 2017. There are some promising signs regarding SDG 13 (Climate Action) and SDG 12 (Responsible Consumption and Production) (Nations, 2019). The signs are evident as countries are making environmental protection mandatory. This progress is being achieved through established National Environment Management Authorities (NEMA) in respective countries working on policy and enacting laws governing the environment and natural resource utilization. Such policies are responsible for natural resource consumption and utilization to achieve sustainability for the sake of future generations.

The onset of the global COVID-19 pandemic in 2019 brought about stagnation in progress. It has precipitated

a humanitarian and economic crisis and poses risks for SDGs that have, in essence, compromised the Decade of Action. Therefore, this analysis shows that countries in the GHA are off-track to achieving the SDGs by the end of 2030.

GHA governments have committed to meeting the 2030 SDGs, but the COVID-19 pandemic has held them back. The continued crisis has seriously affected the progress made at the local and national levels (Bank, Poverty, and Shared Prosperity, 2018).

MATERIALS AND METHODS

This study employed behind-desk design; several documents were subjected to academic assessment and reflection drawn. Most of the documents were reports; especially conference reports and research are done before the development and adoption of the 17-SDGs in 2016. Thus various meetings at the U.N. level formed the basis of this paper. Individual country development plans, especially those developed in 2016 and afterward, were instrumental since they captured and were aligned with the 2030 World Agenda. Also, reports by the private sector and civil societies at national and international levels were considered in this paper. The five countries selected for this study were sampled purposively because they had presented their Voluntary National Review Reports on implementing the 2030 Agenda For Sustainable Development to the U.N. high-level political forum.

RESULTS

The GHA countries are off-track as the entire world is also struggling to progress on the SDGs. The average SDG Index score slightly declined in 2021, partly due to slow or non-existent recovery in poor and vulnerable countries. Multiple and overlapping health and security crises have led to a reversal in SDG progress. Performance on SDG 1(No poverty) and SDG8 (Decent Work and Economic growth) remain below pre-pandemic levels in many low-income countries (LICs) and lower-middle-income countries (LMICs) (Jeffrey et al., 2022) Here, per country status is discussed:

Kenya

Compared to other GHA countries, Kenya is doing better though still off-track in meeting the 2030 agenda. According to *Sustainable Development Report 2022,* it ranks 118 out of 163 countries. This is because of reforms and concerted efforts from various sectors of the economy (Jeffrey et al., 2022).

On SDG 1 (No Poverty), Kenya's headcount ratio at $1.90/day was 15.9% in 2020. The population living below the national poverty line was 36.1% in 2015, while the proportion covered by social protection was 34.7% in 2015. On SDG 2 (Zero hunger), the prevalence of undernourishment was 29.4% in 2017, while cereal yield (tonnes per hectare of harvested land) was 1.5 in 2017, and fertilizer consumption (kg per hectare of arable land) was 38.2 in 2016.

On SDG 3 (Good Health and Well-being), the maternal mortality rate was 342 per 100,000 live births in 2017. On SDG 4 (Quality Education), the net primary enrollment rate was 80.0% in 2012, and the mean duration of schooling (in years) was 6.5 in 2017. Also, the literacy rate (percentage of the population aged 15 to 24 that can read and write) was 87.8% in 2018 (Eve Mothe, 2018).

On SDG 5 (Gender Equity), 21.8% of seats in national parliaments were held by women in 2020, and 25.0% of ministerial positions were held by women in 2017. The ratio of female-to-male mean years of education received was 83.3% in 2018. The ratio of female-to-male labor force participation rate was 92.0% in 2019. Regarding SDG 6 (Clean Water and Sanitation), 58.9% of the population used essential drinking water services in 2017, while 29.1% used at least essential sanitation services in 2017. On SDG 7 (Affordable and Clean Energy), the proportion of the population with access to electricity was 63.8% in 2017, and the proportion of the population with access to clean fuels and technology for cooking was 13.4% in 2016. Renewable energy consumption was 71.8% in 2017, while consumer electricity affordability (on a scale of 0 to 100, with the worst being 0 and the best being 100) was rated 67 in 2017 (Bank, The Human Capital Project, 2018).

Regarding SDG 11 (Sustainable Cities and Communities), the urban population living in slums was 46.5% in 2016, and the percentage of those with access to an improved water source (piped) was 61.7% in 2017. On SDG 12 (Responsible Consumption and Production), the natural resource value realization score (on a scale of 0 to 100, with the worst being 0 and the best being 100) for production-based SO2 emissions (kg/capita) was 7.4 in 2012. On SDG 13 (Climate Action), the number of people affected by climate-related disasters (per 100,000 populations) was 2466.4 in 2019.

In conclusion, the fight against poverty (SDG 1) and Hunger (SDG 2) needs congregate strategies and practical plans. Attaining high standards of health (SDG 3), ensuring access to affordable and quality education (SDG 4), addressing gender parity (SDG 5), mitigating climate change (SDG 13), and ensuring decent work and living conditions (SDG 8) has to be given priority. The above are critical in the Kenyan context because they are yet to be attained. For instance, the healthcare sector suffers from a shortage of workers and defective drugs, especially in rural areas (CSOs, VNR Report, 2020).

In addition to the above, there is still a need for more financing for achieving and streamlining the data sources to monitor the goals. This also extends to localizing SDGs by mainstreaming program indicators and adopting local languages. Kenya needs some form of an SDG tracker that would help monitor how the country is progressing on its goals. Hence it might be a better place to know the country's progress (CSOs, VNR Report, 2020). The government has prioritized the "Big 4 Agenda'

focusing on Food and Nutrition, Security, Healthcare, Manufacturing, and Affordable Housing, accelerating SDGs 2,3,8, and 11 (Kenya, Voluntary National Review, 2020).

Ethiopia

Six SDGs are under discussion (1, 2, 3, 5, 9 and 14) in analyzing Ethiopia's progress in its voluntary national review. These are critical pillars of other SDGs because when they are aligned appropriately, they will trigger the achievement of the rest. When it comes to promulgating the principles of 'Leaving No One Behind' when implementing the SDGs, Ethiopia ensures that the population is aware of the SDGs and participates in the planning, implementation, monitoring, and evaluation stages (Ethiopia, 2018).

On SDG 1 (No Poverty), the $1.90 /day poverty headcount ratio was 25.3% by 2020. The population living below the national poverty line was 23.5% by 2015, while the population covered by social protection was 16.2% by 2010. There is a continuous effort to end poverty in all its forms everywhere, to ensure the development of the agriculture sector, which remains the principal source of economic growth, and to bring about the expansion of the manufacturing industry through encouraging private investments and coordinating investment. Secondly, the government is expanding small and medium enterprises. There are increasing efforts to conserve and develop natural resources and strengthen government development programs' implementation. Lastly, efforts are paving the way for smaller companies to grow into larger ones. This to succeed requires concerted efforts to be put in place to fast-track all federal government strategic development plans geared toward realizing the 2030 Agenda (Ethiopia, 2018).

On SDG 2 (Zero hunger), the prevalence of undernourishment was 20.6% by 2017. This goal aims to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture. The government has set principal directions such as developing and utilizing the knowledge and skills of the country's human capital, effectively exploiting land resources, and preparing and implementing environment and ecosystem-compatible rural development packages. Market-led agricultural development is also promoted, improving the rural financial systems and encouraging the private sector to invest in agricultural development. Finally, policies seek to strengthen other non-agricultural, rural-based economic activities.

On SDG 3 (Good Health and Well-being), the maternal mortality rate (per 100,000 live births) was 401 by 2017. Goal 3 is to ensure healthy lives and promote well-being for all ages. The neonatal mortality rate (per 1,000 live births) had dropped to 27 by 2020 (Jeffrey et al., 2022). The government has worked hard to provide all Ethiopians access to public health and education, clean water, housing, food, and social security. Although no independent reports, such as civil society or institutions, critique or validate the government reports, the health sector has faced severe challenges for four years.

On SDG 5 (Gender Equality), women's seats in the national parliament are 195 out of the 470 members, which is 35.65%. At the same time, women were 47.6% of those in ministerial positions in 2019. To achieve gender equality and empower all women and girls, the main objective of the women's policy is to create an environment that enables women to participate at all levels in economic, social, and political activities. The national and sectoral policies, strategies, plans, and programs provide for the promotion of the rights and benefits of women. Fostering the participation of women and youth is of utmost importance. The national and sectoral policies, strategies, plans, and programs have provisions for promoting the rights and benefits of women.

SDG 9 (Industry, Innovation, and Infrastructure), the score (on a scale of 0 to 100, with 0 being the worst and 100 being the best) was 46.8 by 2017. They build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. For example, the length of all-weather roads has increased to 113,067 km. In contrast, railway infrastructure development is being expedited following policy directions to expand passenger freight transport.

Goal 14 is to conserve and sustainably use the oceans, seas, and marine resources for sustainable development; however, Ethiopia is landlocked and has no territorial link with oceans, seas, and marine resources. It has water bodies like lakes and rivers. Therefore, the government has continued to implement Goal 14 in its context as the highest capacity, but against this background, it is still off-track in meeting the 2030 Global Agenda (Banerjee, 2022).

Like most GHA countries, Ethiopia is making progress on the SDG on quality education, where it has over 80% of school enrollment. The above SDGs require special attention if Ethiopia hopes to meet the 2030 Global Agenda. Given the above data, Ethiopia is ranked 128 out of 163 countries in the world as far as meeting the 2030 agenda is concerned, according to the *Sustainable Development Report 2022* (Jeffrey et al., 2022).

Uganda

In line with the post-2015 development agenda, the Ugandan Parliamentary Forum on Millennium Development Goals was changed to Uganda Parliamentary Forum on Sustainable Development Goals to fast-track the achievement of the 2030 World Agenda. The seventeen Sustainable Development Goals are new to the majority of Ugandans. Members of the 10th

Parliament passed a resolution to reaffirm the role of parliament in implementing Sustainable Development Goals.

Having mainstreamed the SDGs in their development plan draft as early as the beginning of 2015, the implementation of the second National Development Plan: 2015/16–2019/20) started in July 2015, 2 months ahead of the official adoption of the 2030 Agenda. The NDPII is part of the comprehensive National Development Planning Framework and is being implemented through the National Vision 2040 and 5-year National Development plan. By implication, Uganda began implementing the 2030 Agenda ahead of the rest of the world (UNDP, 2018). By 2016, the NDPII was aligned with 76% of the SDGs, fully integrating these nine SDGs 1, 2, 5, 6, 7, 8, 9, 12, and 13 (Ibrahim, 2019).

Through its national development plan incorporation with Agendas 2030 and A.U. 2063, Uganda has submitted its second VNR in the HLPF 2020. Government mechanisms have been institutionalized at the national level to promote awareness and improve the bureaucracy's capacities in their implementation (Uganda, UGANDA VISION 2040, 2017). Despite the political sensitivity and difficult measurability, Uganda has data on SDG 16. There are best practices of inclusive measures by Uganda, such as sharing the data on government expenditures as a proportion of the original approved budget by sector from 2005 to 2016. These are captured in the VNR reports and the U.N. SDGs database (UGANDA, 2020). Uganda has developed indicators to offer a space for citizens to express their opinions on public services, such as education, health, and other services. About 66% of the population is satisfied with local government services. Uganda ranks highly in the Open Budget Index as one of the most transparent budgets in Africa (ISDC, 2020).

Uganda showed its early adoption and commitment to implementing the Rio Declaration, known as 'Agenda 21', and its outcomes, such as the Rio-environmental conventions. Uganda adopted at the early stage of the Millennium Development Goals. Uganda relocated its development approaches toward its achievements. Commitment to sustainable development (S.D.) strategies is further proven by Uganda's operation and continued participation in international and regional progressions on sustainable development. These include the World Summit on Sustainable Development (WSSD), the Commission for Sustainable Development (CSD), Rio Conventions, and the New Partnership for Africa's Development (NEPAD) Environment Action Plan, and the Comprehensive African Agriculture Development Programme (CAADP).

The Gross Domestic Product (GDP) for the fiscal year 2009/10 was about US$17 billion, with agriculture (crops, livestock, forestry, and fishing) accounting for nearly 24% of the total GDP. In 2009, it was estimated that nearly 25% of Ugandans lived below the national poverty line, with rural poverty currently at about 34% and urban poverty at 14% (UBOS, 2011). Beyond the localization agenda, it is common knowledge that the SDG" war' will be won or lost in the leadership arena. Therefore, the SDGs will be achieved, and the countries will thrive with decisive, citizen-based, and inclusive leadership (Uganda, Voluntary National Review Report). On the implementation of the 2030 Agenda For (Sustainable Development, (CSPDD) 2021). Therefore, the SDG Index and Dashboards are concerned; Uganda is ranked 136 out of 163 world countries to meet the 2030 Global Agenda according to the 2022 world report. This shows that it is off-track, and therefore, there is a need for the government to fast-track socio-economic and political reforms (Jeffrey et al., 2022).

Djibouti

Djibouti Vision 2035 aims to make the country a trade hub, such as logistics and finance in the Greater Horn of Africa. A diversified economy and growing acceleration result in sustainable economic development and poverty reduction in a peaceful environment. The first development plan of the "Accelerated Growth and Employment Promotion Strategy," implemented from 2015 to 2019, was not produced as a comprehensive achievement report. However, the VNR report mentioned that it was achieved and created more jobs and long-term development programs. They were followed by the "Inclusion, Connectivity, and Institutions (ICI) plan" from 2020-2024, which seems to be fully aligned with the sustainable development goals (Djibouti, 2022).

Regarding SDG 1 (No Poverty), Djibouti's headcount ratio at $1.9 per day was 13.9% by 2020. The population living below the national poverty line was 21.1% by 2017. Moreover, the population covered by social protection was 35.7% by 2012. Concerning SDG 2 (Zero hunger), the prevalence of undernourishment was 18.9% by 2017. On SDG 3 (Good Health and Well-being), the maternal mortality rate, for example, was 248 (per 100,000 live births) by 2017. On SDG 4 (Quality Education), the net primary enrollment rate was 66.5% by 2019 (Aheisibwe, 2020).

Concerning SDG 5 (Gender Equality), 26.2% of seats in the national parliament were held by women by 2020, and women held 10.0% of ministerial positions by 2019. On SDG 6 (Clean Water and Sanitation), 75.6% of the population was using at least essential drinking water services by 2017, 63.6% was using at least vital sanitation services by 2017, while 0.0% was anthropogenic wastewater was receiving treatment by 2018. Regarding SDG 7 (Affordable and Clean Energy), 60.2% of the population had access to electricity by 2017, while the 11.55% of the population had access to clean fuels and technology for cooking by 2016, and renewable energy consumption was 14.5% of total energy consumption by

2017 (Benin, 2016).

The above statistics clearly show that Djibouti is far from showing signs of meeting the 2030 Agenda. However, there are strategies put in place through its National Development Plans that touch on the alignment to the A.U. 2063, Vision 2030, and, subsequently, the SDGs. Achievement of these goals will require resources and concerted effort from the government, civil society organizations, the private sector, and donors, as well as formidable and feasible strategies to bring the country back on the SDGs track. Djibouti is ranked 155 out of 163 world countries as far as meeting the 2030 agenda is concerned, according to the *Sustainable Development Report in 2022*. This position is not promising, hence pulling up the socks for the country (Jeffrey et al., 2022).

Somalia

Somalia is ranked poorly according to the *Sustainable Development Report 2022.* It is ranked 160 out of 163 countries as far as meeting the 2030 global agenda is concerned (Jeffrey et al., 2022). Somalia has made minimal progress on SDG 1 (No Poverty); the poverty headcount ratio at $ 1.90/day was 69% in 2017. VNR report 2022, Somalia mentioned only one intervention project named "Social Protection and disaster risk management" funded by external donors, also not show how this project improved the lives of the poor. On SDG 2 (Zero hunger), the rate of undernourishment was 2% in 2009, and cereal yield (tonnes per hectare of harvested land) was 0.5 in 2017. On SDG 3 (Good Health and Well-being), the maternal mortality rate (per 100,000 live births) was 829 in 2017. There is no data on SDG 4 (Quality Education). On SDG 5 (Gender Equity), 24% of seats in the national parliament were held by women in 2020, while 14.8% of ministerial positions were held by women in 2019. On SDG 6 (Clean Water and Sanitation), the proportion of the population using at least essential drinking water services was 52.4% in 2017, while the proportion of the population using at least essential sanitation services was 38.3% in 2017 (ANDP, 2020).

On SDG 7 (Affordable and Clean Energy) 32.9% of the population had access to electricity in 2017 and 2.3% had access to clean fuels and technology for cooking in 2016. Renewable energy consumption was 94.9% in 2017. There is no data on SDG 8 (Decent Work and Economic Growth) or the GDP growth per capita 5-year average. SDG 9 (Industry, Innovation, and Infrastructure), the infrastructure score (on a scale of 0 to 100, with 0 being the worst and 100 being the best) was 9.9 in 2017. The score for the quality of trade and transport-related infrastructure (on a scale of 1 to 5, with one being the worst and five being the best) was 1.8 in 2018 (Eve Mothe, 2018).

Regarding SDG 11 (Sustainable Cities and Communities), the proportion of the urban population living in slums was 73.6% in 2016, and the proportion with access to the improved piped water source was 75.4% in 2017. Considering the above statistics, Somalia, given its perennial conflict, will not be able to meet the 2030 Agenda. This is evidenced by the lack of VNR submitted to the U.N. for progress assessment.

DISCUSSION

This study confirmed mild progress registered in the GHA region regarding socio-development, peace and security, and agriculture. For example, concerning SDG 4 (Quality Education), Kenya is on track, with a net primary enrollment rate of 80.0% in 2012 and a mean duration of schooling (in years) of 6.5 in 2017. Ethiopia recorded a net primary enrollment rate of 84.6% in 2015, and Djibouti recorded a net primary enrollment rate of 66.5% in 2019. Djibouti has made an effort to progress toward SDG 6 (Clean Water and Sanitation); 75.6% of the population was using at least essential drinking water services by 2017, and 63.6% of the population was using at least essential sanitation services in 2017. Regarding Kenya's progress on SDG 7 (Affordable and Clean Energy), 63% of the population had access to electricity in 2017, and 13.4% had access to clean fuels and technology for cooking in 2016. Renewable energy consumption was 71.8% in 2017, while consumer electricity affordability *(on a scale of 0 to 100, with 0 being the worst and 100 being the best)* was 67 in 2017. Ethiopia's percentage of renewable energy consumption in total final energy consumption was 89.8% by 2017. Consumer electricity affordability *(with one being the worst and 100 being the best)* was rated 97 in 2017.

Development, therefore, is built on the essential foundation of peace and integration. By pursuing the development plans, these countries are generally on the A.U. Agenda 2063 and SDGs 2030, despite facing challenges and being far behind in achieving the latter. Climate change has negated achievements gained from 2016 to 2019, but more significantly, the COVID-19 pandemic devastated GHA, with the situation made worse by the Russia-Ukraine war. This disaster led to the diversion of development funds to mitigate health challenges caused by the pandemic and its aftermath (Group, 2018). Despite the regional challenges, social indicators show some positive development in line with the SDGs, but such development is minimal. For instance, the region's countries have declined in infant mortality, gender inequality, and poverty. Also, between 2012 and 2019, malnutrition declined from 32 to 29%, respectively (Homi, 2019).

The poverty rate is still high, despite the marginal decline from 32% in 2012 to 29% in 2017, as illustrated in the IGAD State of the Region Report (IGAD, 2020). In this region, 30% of vulnerable urban populations have

been covered by IGAD support through socio-protection programs. The number of people exposed to food insecurity has declined, though not significantly, to about 10% in 2019 (Daniel, 2020).

In conclusion, some countries have tried to remain on track to accomplish one or two of the SDGs, but it remains a tall order for them to have achieved all seventeen SDGs by the end of 2030. The negative impacts of COVID-19, locust infestations, and excessive flooding in 2020, followed by the ongoing war between Russia and Ukraine, have overturned progress in food security. The region fails to remain on track regarding achieving the SDGs because the natural resources are underutilized, and its dependence on agriculture is environmentally vulnerable. Any trade is in the form of exporting raw materials with minimal value addition, fetching the region less foreign exchange. This is seen in the underutilization of fisheries, minerals, and other environmental resources, and any utilization witnessed is not sustainable. As a result, trade, jobs, and wealth creation have deteriorated considerably (GUSTAFSON, 2019).

Regional and continental constraints also exist on the domestication of the A.U. agenda and SDG strategies and frameworks. Whatever individual countries envisaged in achieving the SDGs remains unimplemented because of inadequate national capacities and leadership deficiency. Most countries that lack capacities are still reeling or emerging from internal conflict. Agricultural production and economic growth in the region depend on the land and the environment (UNDP, 2020). Therefore, land degradation and food insecurity have adversely contributed to food insecurity, famine, and poverty, cumulatively taking these countries off track. Without sustainable management of natural resources and environmental protection, it will be a pipe dream for the region to achieve the SDGs by the end of 2030. The region will be challenged to realize peace and security and eradicate poverty if proper leadership is on desks that envisage beyond the minor division.

Achieving gender equality is still far from being realized. Tenure insecurity for women and youth, pastoralists, and other vulnerable groups has stifled sustainable development. Inequality in access to education, information, credit, land, employment, policy inputs, and decision-making power are behind pervasive gender disparities in the region. There is a disparity in the status of women relative to men in terms of sociopolitical and economic aspects. Because of gender-based inequalities in access to and ownership of economic factors of production, women are not fully participating in economic development. Therefore, some cultures discourage women and youth from investing entirely in land and natural resources (WHO, 2020).

Regarding SDGs touching on climate, the countries generally are off-track because of climate variability and changes that are characterized by the region. This region is vulnerable to dry spells, floods, and droughts that occur and recur, contributing to land degradation and food insecurity. This leads to human, crop, and livestock diseases that usher in deaths; land degradation lowers productivity.

The transport costs between and within regional countries are very high because of the highly fragmented markets and poor infrastructure. Market-based policies in most countries are minimally implemented, leading to a paltry 5% of intra-regional trade. The COVID-19 pandemic weight clearly shows that this region will not have achieved the 17 SDGs by the end of 2030. This is because SDG 1 (End Extreme Poverty), for instance, will not be achieved, given that before the pandemic, the 2030 poverty forecast was 26%, far from achieving the 2030 objective. The new forecast after the pandemic shows over 480 million impoverished people in 2030. The pandemic has disrupted SDG 2 (Zero hunger), affecting the entire agri-food supply chain. Movement restrictions and lockdowns across borders have contributed to and even worsened food insecurity in the GHA.

Another SDG that has become a victim of the pandemic is SDG 3 (Good Health and Well-being). Health has been affected viciously. By the end of 2020, the entire continent had recorded 4,000 deaths. SDG 4 (Quality Education for All) has been very much affected in that closure of learning institutions has changed the academic calendar where there is pressure on the institutions for double intake because of delays. It will be a long time before the impact of these interruptions in learning is rectified (Bernick et al., 2021). According to UNESCO, an estimated 1.2 million learners worldwide (68.5% of total enrolled learners) are out of school due to measures enacted to stop the spread of the pandemic. Some students have lost the family breadwinners who would have paid for their education. SDG 5 (Gender Equality) suffered the wrath of the pandemic in a way that left women and girls significantly more affected than men. This crisis is pushing the global economy into a recession that will take a while to normalize (Bennett, 2016).

During the pandemic, washing hands frequently with soap under running water was the main precaution to counter the spread of COVID-19; hence SDG 6 (Water and Sanitation) was affected adversely. The inadequate primary access to clean water has been a formidable challenge for GHA. In Sub-Saharan Africa, about 63% of the people face challenges accessing essential water. Therefore, there are deepening inequalities around this goal as we head toward 2030.

Economic growth was not good even before the pandemic, remaining below the SDG 8 (Decent Work) target; hence, with the recession, there has been a further move away from the target. With the closure of many businesses in industries such as tourism, travel, services, and manufacturing, job security is in jeopardy. About 250 million Africans in informal urban employment have been affected, making the situation worse than

before the COVID-19 pandemic. As stated by UNECA, firms and businesses in African cities are at high risk of COVID-19-related effects, the small and medium enterprises (SMEs) account for 80% of employment in Africa and could face bankruptcy (UNECA, 2020).

GHA is performing dismally on SDG 10 (Reduce Inequality) due to economic shocks from COVID-19 that have exacerbated inequalities in all countries, as we have seen above, especially concerning SDGs 2, 4, 5, and 6. Refugees and migrants, as vulnerable groups, face and will continue to face disproportionate adverse health and economic impacts. This is because the social safety nets for those in the lower-income brackets are missing; they are not even on the agenda of respective governments (Forje, 2020).

Despite the assistance from the UN-led humanitarian response, the IMF and World Bank financial support, and even debt service suspension by the G20 for the poorest countries, the financial gap is still around $44 billion out of the estimated $114 billion that is required to fight against COVID-19. Therefore, it has drastically affected the achievement of SDG 17 (Global Partnerships) (Gregosz, 2020).

Additional to the above challenges, there are specific factors that this paper brings out as to why GHA is lagging in achieving the 2030 Global Agenda. GHA countries are characterized by poor leadership and governance, as regional leaders failed to draw common grounds for development orientations. Even though the forum of heads of state at IGAD region failed to orientate their respective populations and set common regional core values with common aspirations to fast-track development aspects, this is happening because member states do not autonomously empower IGAD to invest correctly in the regional organization. Therefore, even with enormous resources, if there is poor leadership and less investment in human capital, then resources are not prudently allocated. Inter and intra-conflict in the GHA, there is very little in terms of development in the specific SDGs. It is proven that no investors are willing to risk investing where there is conflict. Most countries, such as Ethiopia, Somalia, Sudan, and Uganda, are embroiled in intrastate or interstate conflicts.

IGAD's initial mandate was to reduce drought in the GHA through environmental disciplines in various GHA countries. The recurrence of drought every four years threatens food security and directly or indirectly affects several SDGs. This is because there is a lack of common drought prevention and mitigation strategies and resilience programs characterized by coping mechanisms, leaving the GHA vulnerable to climatic changes.

Locust invasion has been witnessed in the last four years, as this has left a devastating effect on the crops and vegetation. Because of this, the crop yield has been low, leading to severe food insecurity and general development. This is since revenue that would have been channeled to development projects is diverted and redeployed to food importation, characterized by high prices creating an imbalance of payments. Evidence shows that rich countries generate international spillovers, notably through unsustainable consumption. There is a generation of negative socio-economic and environmental spillovers, including through unsustainable trade and supply chains. For example, European Union has called for zero tolerance" of child labor and has proposed using trade to export European values worldwide (Jeffrey et al., 2022).

Conclusion

The Greater Horn of Africa region is off-track on most of the 17 Sustainable Development Goals for internal and external details. The region will only be able to get back on track to achieving the SDGs if they wisely adhere to their national plans by fully aligning them with the 2030 global agenda. They lack the goodwill to fast-track the move toward the SDGs.

They also lack resources to pump into the noble and robust sessional papers and socio-economic and political plans they have put in place.

These countries need external support from resources to experts to guide and help them on this journey. Without such support, the region may not be able to meet the targets of the sustainable development goals by 2030, which calls for a concerted effort by individual countries and the regional block under the auspices of IGAD. The accurate picture is that given the devastating and ongoing negative impacts of COVID-19 and now Russia-Ukraine, most of the region's economies are not on the path of growth; instead, they are on a path of decline. Since most countries allocated a large number to address health which would otherwise have been used for development, it will take a while before the region recovers from the aftermath of the COVID-19 effect. Therefore, given the myriad of setbacks, the region would require external and internal goodwill and collaborative leadership to spring up again.

The A.U. Agenda 2063 and SDGs are mutually supportive and coherent. There are some differences, but they do not affect how either entity implements its agenda. Both agendas can be made to work together, so there is no reason to worry about their complementarity. This is because when negotiations started on the Post-2015 Development Agenda, Africa developed a common African position on the issue. This specific position is accommodated mainly in the 2030 Agenda for Sustainable Development, except for certain aspects, which the A.U. has now included in Agenda 2063. The health systems have been made worse with the onset of COVID-19, which weighed down the already unstable healthcare systems. Thus, death rates are higher for women of children bearing age and children under five, who face the same menace.

However, despite the underperformance detailed above, there is hope given that countries" respective National

Development Plans and Vision 2030 are on course. Yes, there are chronic challenges, but the region is hopeful that by 2030, it will be very much on track to meet the 2030 Global Agenda. Examining the above statistics, it is evident that GHA is lagging and is off-track in terms of poverty and hunger eradication. Most of its population still lives below the poverty line, struggling daily to make ends meet. This is because the production level is below average; as a result, job creation is deficient, resulting in lower living standards due to low family disposable incomes.

Recommendations

1) The region can overcome all the existing challenges by building practical cooperation and collaboration between the states, such as building a robust regional coordination and integration mechanism with regional core values that can unite the minds of the mass society into common good aspirations. This will minimize the difference between the states and societies by creating a synergy of unity and collective prosperity.
2) The environment and natural resources are the bedrock of building sustainable development. Sustainable natural resources management and environmental protection are critical pillars in realizing security, peace, and poverty eradication.
3) The region needs to exploit transboundary natural resources, such as forests, and tap mineral resource potential by value addition before export to earn substantial foreign exchange; part of those earnings can then be used in financing development projects in respective countries.
4) Achievement of the sustainable development goals remains a mirage, given the high population growth rates, which put pressure on the available resources, strain the carrying capacity, and contribute to youth unemployment. The increased youthful population is not optimally utilized, exacerbating youth unemployment in the long run, nor is it effectively harnessed for development. The drastic effects of poverty, climate change, gender inequalities, insecurity, and weak economic bases in respective countries further aggravate unemployment.
5) In addition, the private sector and the youth have low access to financial services, which could be used to finance investments, bringing about high production and job creation that could foster economic growth. Therefore, the government and private sector involvement in funding youth-related programs is meager.
6) The coming into effect of the African Continental Free Trade Area (AfCFTA), which will rationalize and harmonize trade and investment protocols and agreements, is likely to contribute significantly not only to Africa's economic development as a whole but also to, more importantly, to the GHA. This would motivate and trigger the development impetus needed for sustainable development. This will turn around trade and, subsequently, the economies of the African countries since AfCFTA emphasizes the reduction of tariffs and non-tariff barriers and facilitates the free movement of people and labor, right of residence, right of establishment, and investment. Despite its extensive promotion by the A.U. leadership, some experts have cautioned against going forward with AfCFTA, yet expectations remain high. There are several challenges on the road ahead.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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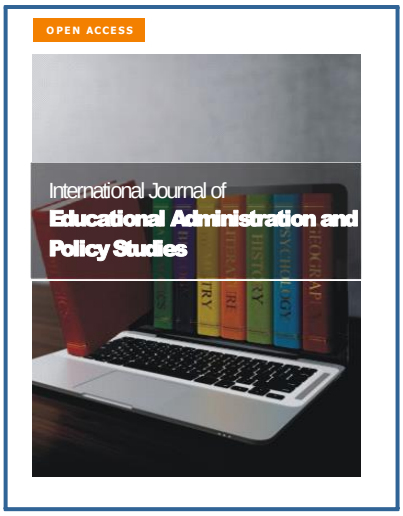

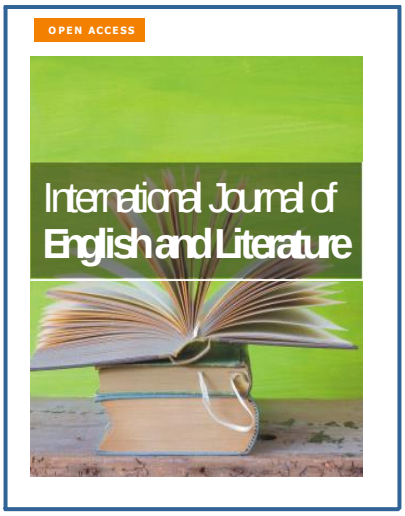

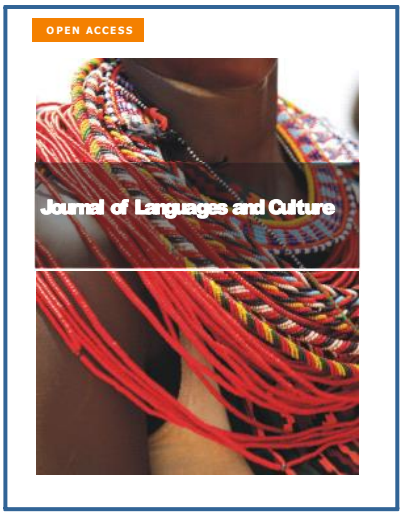

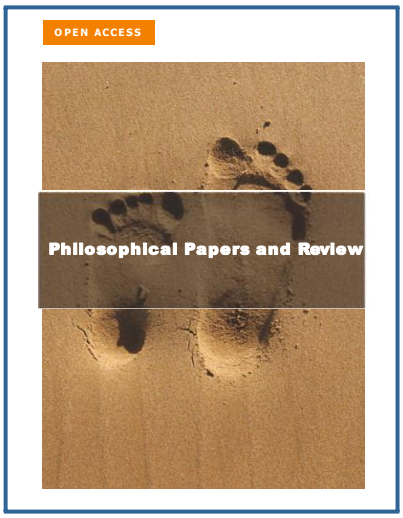

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