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COVID-19 and the Attainment of Sustainable Development Goals in Nigeria: A Simulation Analysis

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Abstract

This paper attempted a simulation analysis of the impact of COVID-19 on sustainable development (SD) in Nigeria from December 2019 to December 2021. It used a mixed frequency data analysis (MIDA) for the simulation because the data could not be sampled at the same frequency. For instance, COVID-19 was sampled on a daily basis while real gross domestic product (GDP) growth rate, oil price were sampled on a quarterly basis while unemployment and CO_2 emissions data were sampled yearly. But forecasting models generally require data to be of the same frequency. The paper therefore, employed a simple time averaging, a step-weighting function and exponential Almon polynomial MIDAS to forecast the variables. Results from the simulation analysis indicated that a 50 percent increase in the cases of COVID-19 is simulated to decrease real GDP growth (economic pillar of SD), decrease CO_2 emissions (environmental pillar of SD) and increase the rate of unemployment (social pillar of SD) from the baseline period to the last quarter of year 2021. The result further indicated that a 50 percent decrease in the cases of COVID-19 is simulated to increase real GDP growth, increase CO_2 emissions and decrease the rate of unemployment from the baseline period to the last quarter of year 2021. As part of policy recommendations, governments and other partners need to enhance access to basic services and improve health and social protection transfers. And for all of these to be sustainable, there is the need for rebalancing the relationship between nature, climate and economy.

Keywords: COVID – 19, GDP growth rate, Unemployment rate, Policy, Economy
JEL Classification: E1, E32, E43, H0, H1

1.0 Introduction

The world economy has tumbled and loomed into recession as most economic and financial indicators are negative, showing red signals. Revenue projections are darkening from gloom to doom due to general silence in global factories and industries where wealth is produced and workers earn their living from, as COVID-19 became a global pandemic. African countries are caught in this chaotic and confusing economic atmosphere as commodity prices including that of oil and gas have sunk into a dark depth where the price of a barrel of crude oil has, at a point, fallen below its production costs. COVID-19 has created global economic tensions that could

gravitate towards a depressing world economy as big corporations are stagnating and small businesses that create much of the employments are closing shops in many countries, including Nigeria (World Bank, 2020). Given the enormity of the issue, Balwin and Mauro (2020) reiterated that the virus is as contagious economically as it is medically.

The World Health Organisation (WHO) had declared COVID-19 a pandemic on March 11, 2020 next to a related declaration on the swine flu in 2009. According to WHO (2020), symptoms of coronavirus include fever, high body temperature, cough, shortness of breath and breathing difficulties. In more severe cases it could lead to Pneumonia, multiple organ failure and even death. Current estimates of the incubation period – the time between infection and the onset of symptoms, range from 1 to 14 days. However, the WHO observed that infected persons could also be asymptomatic – meaning they do not display any symptoms despite having the virus in their systems.

As infections and deaths soared as a result of COVID-19, governments around the world have taken unprecedented measures - including lockdowns and quarantines, isolations and social distancing, school and business closures, and travel restrictions - to stem the spread of the virus. These measures and the unprompted reactions of consumers, workers and businesses, have caused severe disruptions to activity in many sectors and a sharp global economic downturn. This has been accompanied by record capital outflows from emerging market and developing economies (EMDEs), a collapse in global trade, a crash in stock exchanges, a plunge in oil demand, food scarcity, shortages of goods and services, loss of purchasing power and fall in global aggregate demand. Despite these measures, the pandemic has continued unabated and global economic and manpower losses have been horrendous. It means that COVID-19 is still spreading as recession deepens, and Malpass (2020) cautioned that African countries (including Nigeria) are under immense pressure because of the global recession.

African economies are facing their worst economic conditions in decades and COVID-19 pandemic has either exasperated the situation or further exposed the existing vulnerabilities of the African economies. Consequently, commodity prices have fallen drastically, and the situation is precarious for oil producing countries of Africa, of which Nigeria is not an exception. Job losses, reduction in trade and declining export revenue, withdrawal of portfolio investment and decrease in foreign direct investment (FDI), shrinking GDP or economic contraction, and increase in the number of poor people have further raise the anxieties for urgent action. It implies that if appropriate measures are not taken, many African countries may slide into depression. This paper takes stock of the consequences of the pandemic for the Nigerian economy and attempts to provide solutions to the problem. The concern of this paper is whether Nigeria could muster the strategy to creatively craft a plan to transition to a post COVID-19 world and guarantee sustainable development. Although, there are plethora of studies on COVID-19 and sustainable development goals (SDGs) in Nigeria such as Fagbemi (2021); Oggisi and Begho (2021); and Ibukun and Adebayo (2021) who focused their studies on descriptive analyses without looking at the empirical aspect of COVID-19 and SDGs. To close the existing empirical gap, the present study does not only empirically analyse the impact of COVID-19 on SDGs in Nigeria but also simulated the behaviour of SDGs' macroeconomic

fundamentals in the future. Against this background, the objective of this paper therefore, is to examine the impacts of COVID-19 on the Nigerian economy as it relates to sustainable development and suggest strategic options for improving the economy and accelerating the attainment of SDGs in the country.

The paper is concisely divided into five sections. The foregoing is the introductory section one. Section two reviews related literature including conceptual definitions, empirical review and theoretical basis. Section three describes data sources and method of analysis. While section four gives the results and discusses the findings of the paper, section five concludes with policy recommendations.

2.0 Review of Related Literature

2.1 Conceptual Definitions

David (2020) defined COVID-19 as an illness caused by a novel coronavirus now called severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), first identified in Wuhan City, Hubei Province, China. It was initially reported to the World Health Organization (WHO) in December 2019. On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency. On March 11, 2020, the WHO declared COVID-19 a global pandemic. Illness caused by SARS-COV-2 was recently termed COVID-19 by the WHO, the new acronym derived from 'Coronavirus Disease 2019'. The name was chosen to avoid stigmatizing the origin of the virus in terms of population, geography, or animal associations.

A pandemic is a sudden outbreak that becomes very widespread and affects a whole region, a continent, or the world due to a susceptible population, thereby causing a high degree of mortality or death (William, 2018). When a disease occurs in greater numbers than expected in a community, region, or season, it is considered an outbreak. In addition to human suffering, outbreaks create panic, disrupt the social and economic structure, and can impede development in the affected communities and countries. While we cannot predict exactly when or where the next epidemic or pandemic will begin, it is important to explore and learn from outbreaks of the past (Oxford Academic Journals, 2020). Pandemics are large-scale outbreaks of infectious disease that can greatly increase morbidity and mortality over a wide geographic area and cause significant economic, social, and political disruptions. Evidence suggests that the likelihood of pandemics has increased over the past century because of increased global travel and integration, urbanisation, changes in land use, and greater exploitation of the natural environment (Jones *et al*, 2008; Morse, 1995).

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

2.2 Theoretical underpinning

Although there is yet no comprehensive theory of Pandemic, the protagonists of the theory of epidemics such as Hoppensteadt and Peskin (1992) would argue that the spread of a contagious disease involves interactions of two populations; the susceptible and the infective. When there is fast rate of communicable infection from one person to another on a widespread scale, an epidemic will soon gravitate into a pandemic posing grave consequences on lives and means of livelihood, resulting in death, loss of productive manpower/workforce and job losses as well as economic devastation of a global scale. From the foregoing, pandemics can cause significant, widespread increases in morbidity and mortality and have disproportionately higher mortality impacts on low-and-middle-income countries when compared with developed economies.

Pandemics can cause economic damage through multiple channels, including short-term fiscal shocks and longer-term negative shocks to economic growth. Individual behavioural changes, such as fear-induced aversion to workplaces and other public gathering places are a primary cause of negative shocks to economic growth during pandemics. Some pandemic mitigation measures can cause significant social and economic disruptions. In countries with weak institutions and legacies of political instability such as those in Africa, pandemics can increase political stresses and tensions. In these contexts, outbreak response measures such as quarantines, lockdowns and shutdowns could spark violence and tension between states and citizens.

The theory concludes that preparedness to contain with any pandemics has remained a single most important factor. For example, is public health infrastructure capable of identifying, tracing, managing, and treating cases? Do we have adequate physical and communications infrastructure to channel information and resources? It implies that fundamental bureaucratic and public management capabilities and the capacity to mobilise financial resources to pay for disease response and palliatives to citizens as well as the aptitude to withstand the economic shock of the outbreak while maintaining the competence to undertake effective risk communications are necessary.

Economic theory suggests that pandemics are likely to reduce investment demand and raise labour scarcity (Jordà et al, 2020).In addition, four sets of effects are theoretically, identified that result from pandemics: (1) supply-side effects (falls in labour supply and increases in real wages), (2) demand-side effects (falls in consumption), (3) human capital effects (poorer health and education), and (4) social trust effects (between individuals, and towards political institutions). These four factors would eventually lead to fall in economic growth (Berbenni & Colombo, 2021).

Although previous disease outbreaks like the Spanish Flu impacted on financial (stock) markets, its impact is less compared to the COVID-19 pandemic (Baker et al., 2020a). As a disease spread from one country to another, labour supply is constrained with an increased risk in operations of businesses including restrictions on movement or travel, amongst other things (Mohan, 2006). The high uncertainty that accompanies a pandemic or disease outbreak impacts on the survival of existing businesses, establishment of new businesses, investment in human

capital and research and development, as well as factors which affect productivity in the medium-term and the long-term (Baker et al., 2020b). As production declines, businesses' sales and profits reduce too. The poor performance of these firms/businesses is soon reflected in a reduction in the values of their stocks/shares because the holders of these stocks/shares embark on sell-off to avoid further losses on their investments.

The theoretical framework underpins the fact that poor health reduces an individual's productivity and efficiency, and as a result lowers a person's ability to earn substantial income. As people's incomes decline, aggregate demand for goods and services also reduces, which further lessens the need for future investment spending. The increased uncertainty in the business environment can harm the functioning of the economy and scares investors. Greater uncertainty of the COVID-19 pandemic has made markets to be highly unpredictable and volatile with uncommon capital flights and withdrawal of portfolio assets. This work is anchored upon the economic theory as buttressed by Berbenni and Colombo (2021).

2.3 Empirical Review

Scholars have been making concerted efforts to investigate the impacts of disease outbreaks on economies of nations. For example, Lee and Warwick (2004) investigated the economic costs of SARS epidemic on the global economy using the G-Cubed Asia-Pacific model which incorporates rational expectations and forward-looking international behaviour on the part of individual agents. It was found that SARS affected economic activities negatively, trade flows were constrained in affected communities, high mortality rate were recorded and economic slowdown was largely experienced in the region but with a slack in transmission of the SARS disease around the world.

Bartsch, Gorham and Bruce (2015) examined the costs of Ebola outbreak using a tree age pro-2014 by developing a Monte Carlos simulation model to determine the direct medical costs and productivity losses in Guinea, Liberia and Sierra Leone for four types of Ebola Virus Disease (EVD) case: (1) those receiving supportive care who survive, (2) those receiving supportive care who die, (3) those receiving extensive support care who survive, and (4) those receiving extensive support care who die. The study revealed that the three countries affected by the outbreak suffered huge personnel costs and productivity losses. The median treatment and personnel protective equipment (PPE) costs per case were similar across the countries, with differences in personnel costs and productivity losses (due to differences in GNI) accounting for the variation. The study concludes that determining the direct and productivity costs of an EVD case is an indicator of economic burden of the Ebola epidemic that would allow us know the cost impact and cost effectiveness of interventions.

Aside from the devastating health effects, the Ebola epidemic also had a pronounced socio-economic impact in Guinea, Liberia and Sierra Leone. According to projections by the World Bank (2014), an estimated $2.2 billion was lost in GDP of the three countries in 2015. It should be noted that few empirical studies from economic standpoint were actually conducted on SARS, Ebola and other contagious viral diseases. Early studies have claimed that previous disease outbreaks such as the Spanish Flu did not impact on economies of nations as the

COVID-19 pandemic has done (see Baker et al., 2020a). Therefore, based on available literature, none of these studies has carried out a simulation analysis of the economics of coronavirus (COVID 19) pandemic on the Nigerian economy with respect to the attainment of sustainable development goals in the country. This study has covered the gap, and has contributed to existing literature in this area.

Additionally, few studies examined the impact of COVID-19 on sustainable development in Nigeria. For instance, Fagbemi (2021) appraised the emanating effects of COVID-19 on sustainable development goals (SDGs) in Nigeria through the systematic illustration of the prevailing incidents. It was affirmed that the pre-occupation with the COVID-19 cases caused many other critical socio-economic issues (like education, infrastructure development, and employment) to suffer a state of negligence or be overlooked. Ogisi and Begho (2021) examined whether the impact of COVID-19 at the household level is an obstacle to achieving the sustainable development goals of no poverty (SDG1), zero hunger (SDG2), good health and wellbeing (SDG3) and decent work and economic growth (SDG8). Using the World Bank National Longitudinal Phone Survey (COVID-19 NLPS) and the 2018/2019 General Household Survey (GHS).

An exact McNemar's test determined that there was a statistically significant difference in the proportion of households that skipped a meal (p =.002), ran out of food (p =.036) or went a whole day without food (p <.001) pre and during COVID-19. Approximately 81% perceived COVID-19 as a substantial threat to their income. This was buttressed by the finding that 75% reported a decrease in their total income since the outbreak of COVID-19. Overall, the findings in this paper suggest that COVID-19 posed a substantial threat to the attainment of SDGs 1, 2, 3 and 8.

Further, Ibikun and Adebayo (2021) explored the food security status of households during the pandemic and investigated its determinants using the COVID-19 National Longitudinal Phone Survey (COVID-19 NLPS). In analysing the data, descriptive statistics, and bivariate as well as multivariate analyses were employed. Findings from the descriptive statistics showed that only 12% of the households were food secure, 5% were mildly food insecure, 24.5% were moderately food insecure and over half of the households (58.5%) experienced severe food insecurity. The result from the ordered probit regression identified socio-economic variables (education, income and wealth status) as the main determinants of food security during the pandemic.

This study indicates that over two-thirds of households were threatened by food insecurity in Nigeria. The finding indicates the gross inadequacy of government palliative support and distribution. Using the conceptual approach, Iwuoha and Jude-Iwuoha (2021) analysed the challenges facing the attainment of sustainable development goals 1, 2, 3, 4, 8, and 10 and globalisation in the face of COVID-19. It is found that healthy living, inequality, globalisation, etc, are affected by COVID-19 and the poor and vulnerable becomes poorer as job losses increase.

3.0 Methodology

3.1 Data Sources and Estimation Techniques

For the purpose of empirical model estimation, we use available data for Covid-19 on daily basis from January 2021 to April 2021, oil price, and other sustainable development indicators such as growth rate of real Gross Domestic Product (GDP), unemployment and CO_2 emissions are sampled from 2010 to 2021 on quarterly basis and converted to daily basis. The study applied a mixed frequency data analysis (MIDA) for the simulation. This is because forecasting macroeconomic variables is an important task for central banks, financial firms, and any other entity whose outcome depends on business cycle conditions. Unfortunately, many important macroeconomic indicators are not sampled at the same frequency. For example, Covid-19 was sampled on daily basis while GDP rate and oil price data were sampled quarterly. Unemployment and CO_2 emissions data were sampled yearly. Forecasting models, however, generally require data to be of the same frequency. This presents a small, yet manageable, problem for the econometrician, for which several solutions are available.

We used MIDA models due to the different frequencies of data. MIDA models have been used to forecast quarterly series using monthly or weekly data. For example, Clements and Galvão (2008) introduced a common factor to the MIDA model with an autoregressive (AR) component. They found that their model provided better forecasts at short horizons—especially within-quarter horizons— than a benchmark AR or an AR distributed-lag model. Kuzin, Marcellino, and Schumacher (2009) used monthly series to forecast euro-area quarterly GDP. They compared the performance of the AR-MIDA model of Clements and Galvão (2008) to a vector autoregression (VAR) and found that the AR-MIDA model performed better near one-quarter horizons, while the VAR model performed better near three-quarter horizons. Galvão (2007) included a MIDA framework in a smooth transition autoregression to allow for changes in a higher-frequency variable's forecasting ability. Her model improved forecasts of quarterly GDP when using weekly short-term interest rate and stock returns data along with term spread data. Table 1 describes, summarizes and presents the sources of the series employed in the paper.

Table 1: Definition, measurement units and source of data for the investigated variables

Variable	Definition	Unit of measurement	Source of data
GDP	GDP growth	Growth rate	CBN Statistical Bulletin
UNEM	Unemployment	Growth rate	CBN Statistical Bulletin Statista (2019)
OILP	Oil price	Naira per barrel	CBN Statistical Bulletin
COVD	Covid-19	Daily new cases	NCDC Daily Bulletin
CO_2E	CO_2 emission	Tons ('000)	WDI (World Bank, 2020)

Researchers' compilation

3.2 Policy Simulations

This section examines the effects of various major policies regarding covid-19 and energy (oil) on the attainment of SDGs. The following simulations are considered in this study:

Case 1: 50 percent increase in the rate of COVID-19.

Case 2: 50 percent decrease in the rate of COVID-19.

In this article, we use simple time averaging, a step-weighting function, and exponential Almon polynomial MIDA to forecast the following variables using the noted data as the predictor: (i) daily data on Covid-19, (ii) monthly GDP growth, using its own lags and monthly real exchange rate, (iii) monthly inflation, using its own lags and monthly interest rates, (iv) monthly oil price. These cases demonstrate how the three methods differ when the difference between the higher and lower sampling frequencies is increased.

3.3 Simulation Type

In this paper we use a deterministic simulation. This involves solving the model without simulating the residuals. In addition, all the estimated coefficients are used in the simulation at their point estimates likewise all the exogenous variables are held constant. For the in-sample simulation, we apply the static solution. This is where the predicted values of the endogenous variables in the model can be compared with historical data. Of course, this will require using the actual values of all the explanatory variables (both the exogenous and the lagged endogenous variables of the model).The predictive ability of the model can be evaluated based on the in-sample simulation.

For the out-sample simulation, we applied the dynamic solution. Under this, we have to forecast all the exogenous variables (COVID-19 and oil price). The future paths of the exogenous variables may be based on the likely policy direction of the economy as to what will actually happen. Statistically, there are different approaches of forecasting time series ranging from naïve, simple average, simple moving average, weighted moving average, trend projection to exponential smoothing. However, we opted for the weighted moving average method. The forecast for the next period (say period T+1) will be equal to a weighted average of a specified number of the most recent observations.

$$Y_{T+1} = \omega_1 Y_T + \omega_2 Y_{T-1} + \omega_3 Y_{T-2} \tag{1}$$

$$\omega_1 + \omega_2 + \omega_3 = 1 \tag{2}$$

Where Y = variable of interest, for instance, GDP. w = weighted average of variables.

We can assume: $w_1 = 0.5$; $w_2 = 0.3$; $w_3 = 0.2$

Therefore,

$$Y_{T+1} = 0.5Y_T + 0.3Y_{T-1} + 0.2Y_{T-2} \tag{3}$$

4.0 Results and Discussion

4.1 Simulation analysis of policy scenarios on sustainable development in Nigeria

In order to achieve the objectives of the study, two counter factual policy scenarios representing exogenous shocks to COVID-19 condition of Nigeria were introduced into the model. The policy shocks are expected to influence sustainable development in terms of economic (real GDP growth rate), social (unemployment rate) and environmental sustainability (CO_2emissions) changes across the economy. The impacts of the various alternative scenarios considered above are discussed in this section. The graphs below show the trend of the endogenous variables to differentiate the actual and the baseline scenarios.

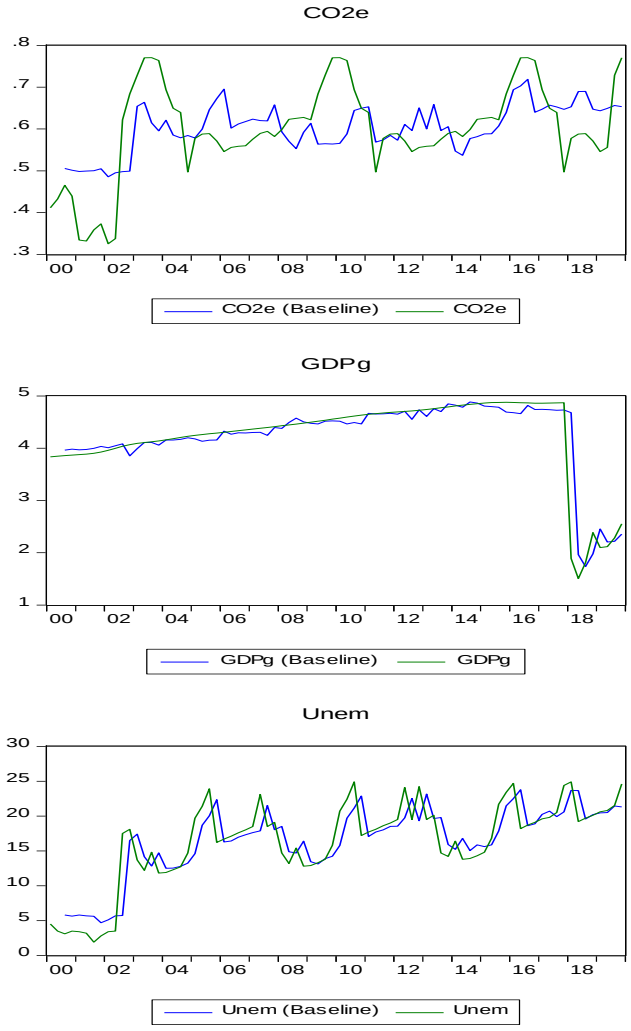

Figure 1: Forecasting/Simulation (Dependent) variables (CO2 emissions, GDP and Unemployment) at their real and baseline trends

In the first and second scenarios, we consider Covid-19 as our policy variable while the price of oil follows its natural path (Do nothing). In the third and fourth scenarios, oil price is considered as the policy variable while we allow Covid-19 to follow its natural path.

Case 1: 50 percent increase in the cases of Covid-19 on sustainable development indicators

The first scenario involves an equi-proportional 50 percent rise in the cases of Covid-19 for all endogenous sustainable development indicators considered in this paper (real GDP growth rate, unemployment rate and CO_2 emissions). This implies a significant rise in the new cases of Covid-19 and deaths on sustainable development variables in Nigeria.

Table 2: Baseline and simulation result of a 50 percent rise in the cases of Covid-19 on sustainable development indicators

	$GDPg_{-1}$	$UNEM_{-1}$	CO_2E_{-1}
2019Q4	2.553	24.602	0.772
2020Q1	2.562	24.332	0.564
2020Q2	2.593	24.990	0.573
2020Q3	2.601	26.654	0.571
2020Q4	2.584	29.732	0.562
2021Q1	2.513	34.785	0.554
2021Q2	2.367	42.735	0.551
2021Q3	2.109	54.953	0.536
2021Q4	1.672	73.523	0.512
Average	2.675	37.367	0.577

Source: Researchers' computation using Eviews-10
Note: GDP_{-1}, $UNEM_{-1}$ and $CO2E_{-1}$ = GDP growth, unemployment and carbon dioxide emissions at the previous and simulated values respectively.

The impacts of the policy on major sustainable development variables are presented in Table 2. The table shows that the impact is huge. On the economic pillar of sustainable development (GDP growth rate) in the first place marginally rises from the baseline value of 2.553 percent in the last quarter of year 2019 to 2.601 percent in the third quarter of year 2020. From the third quarter of year 2020, GDP growth rate falls from 2.601 percent to 2.58 percent in the last quarter of year 2020 and it is simulated to further fall from 2.513 in the first quarter of year 2021 to 1.675 in the last quarter of year 2021. The value at the last quarter of 2021 is lower than the value of GDP growth before the pandemic in the fourth quarter of 2019 (2.553). Although, the value of GDP growth falls as a result of the pandemic, on the average, GDP growth rate between the simulated periods stands at 2.675 percent. This analysis is on the basis of 50 percent rises in the case of COVID-19. The result is consistent with the findings of World Bank (2014) which projected that the Ebola epidemic also had a pronounced socio-economic

impact in Guinea, Liberia and Sierra Leone where an estimated $2.2 billion was lost in GDP of the three countries in 2015.

In addition, on the social pillar of sustainable development (unemployment) rate marginally falls from the baseline scenario value of 24.602 percent in the first quarter of year 2019 to 24.332 percent in the first quarter of year 2020. However, from 24.332 in the first quarter of year 2020, unemployment is projected to rise to 29.732 percent in the last quarter of year 2020 with continuous increase in the cases of COVID-19. With further increase in the cases of the pandemic, unemployment is also calibrated to rise from 34.785 percent in the first quarter of year 2021 to 73.517 in the last quarter of year 2021. The average rate of unemployment within the calibrated periods is forecasted at 37.367 percent which is higher than the value (24.602) before the pandemic. This is in consonant with the findings by Fagbemi (2021) who found that COVID-19 posed significant socio-economic dislocations to employment, education, infrastructure and economic development in Nigeria.

On the environmental pillar of sustainable development (CO_2 emissions), a 50 percent rise in the cases of COVID-19 would lead to a fall in environmental degradation caused by emissions of greenhouse gases of CO_2 from 0.772 percent being the baseline scenario in the last quarter of year 2019 to 0.564 percent in the first quarter of year 2021. Nevertheless, with continuous increase in the cases of the disease, CO_2 emission is forecasted to rise marginally from 0.564 percent in the first quarter of year 2021 to 0.573 percent in the second quarter of year 2021. However, CO_2 emissions would fall from 0.573 in the second quarter of year 2021 to 0.571 percent, 0.562 percent, 0.554 percent, 0.551 percent, 0.536 and 0.512 percent in the third quarter, fourth quarter of year 2020, first quarter, second quarter, third quarter and fourth quarter of year 2021 respectively. The average CO_2 emissions within the simulated period is 0.557 percent which is lower than the value (0.772) before the pandemic. This analysis is line with growth-energy-environmental hypothesis which postulated that greenhouse emissions are caused by anthropogenic activities.

Case 2: 50 percent reduction in the cases of Covid-19 on sustainable development indicators

Rather than assuming a 50 percent increase in the rate of Covid-19, government's effort in combating the scourge may yield a 50 percent reduction in the cases of Covid-19. This is what the objective of the second scenario attempts to evaluate. Table 3 provides an overview of the sustainable development indicators' impacts of a 50 percent reduction in the cases of Covid-19 and allowing the price of oil to follow its natural path.

Table 3: Baseline and simulation result of a 50 percent reduction in the cases of Covid-19 on sustainable development indicators

	GDP-2	INFR-2	REXR-2
2019Q4	2.553	24.602	0.772
2020Q1	2.563	23.903	0.663

2020Q2	2.602	23.362	0.694
2020Q3	2.645	22.694	0.693
2020Q4	2.704	22.043	0.685
2021Q1	2.756	21.415	0.776
2021Q2	2.812	20.814	0.778
2021Q3	2.863	20.245	0.863
2021Q4	2.927	19.716	0.867
Average	2.713	22.088	0.754

Source: Researchers' computation using Eviews-10

The impact of a reduction in the rate of Covid-19 is also huge but in the opposite direction, just as in the case of first scenario. The economic pillar of sustainable development indicator (GDP growth rate) rises from the baseline period (fourth quarter of year 2019) value of 2.553 percent to 2.563 percent in the first quarter of year 2020. It later increases from 2.563 percent in the first and projected to increase to 2.602 percent in the second quarter, 2.645 percent in the third quarter and 2.704 in the last quarter of 2020. Further, real GDP growth rate is projected to rise from 2.756 percent in the first quarter of 2021 to 2.812 percent, 2.863 percent in the third quarter and 2.927 percent in the last quarter of year 2021 respectively. The average value of GDP with a 50 percent in the reduction of COVID-19 cases stands at 2.713 percent within the baseline and the simulation period which is lower than the value (2.553) before the pandemic.

Average unemployment is 22.088 percent with the assumption of a fall in the cases of COVID-19 by 50 percent in Nigeria. This value is lower than the average unemployment level (37.367) during the first scenario of a 50 percent increase in the cases of COVID-19). From baseline period (fourth quarter of 2019) of a value 22.602 percent, it is projected to further fall to 23.903 percent in the first quarter of year 2020 and projected to further fall to 23.362 percent in the second quarter of year 2020. In the event of a continuous 50 percent reduction in the cases of the diseases, unemployment is simulated to further fall from to 22.694 percent and 22.043 percent in the third quarter, fourth quarter of year 2020 respectively. A further fall in the rate of unemployment form 21.415 percent from the first quarter of year 2021 to 20.814 percent, 20.245 percent and 19.716 in the second quarter, third quarter and fourth quarter respectively of year 2021.

CO_2 emission is expected to rise but however fall from the baseline period (fourth quarter of year 2019) value of 0.772 percent to 0.663 percent in the fourth quarter of year 2020 with further reduction in the spread of the virus. A further 50 percent reduction in the cases of COVID-19 is forecasted to raise the level of CO_2 emission from 0.694 percent in the second quarter of year 2020 to 0.685 percent in the last quarter of year 2020. In addition, CO_2 emissions simulated to rise form 0.776 percent in the first quarter of year 2021 to 0.778 percent, 0.863

percent and 0.867 percent in the second, third and fourth quarter respectively of year 2020. This analysis further demonstrates that rising cases of COVID-19 would affect sustainable development indicators in Nigeria negatively while the reverse is the case.

5.0 Conclusion and Policy Recommendations

In this paper, we examined the impact of the pandemic (COVID-19) on sustainable development indicators in Nigeria by simulating different scenarios. In order to capture the impact of the policy changes on sustainable development in Nigeria, the paper focused on the three pillars of sustainable development – economic pillar, social pillar and environmental sustainability pillar. In the first scenario, we investigated the impact of a 50 percent rise in the new cases of COVID-19 on real GDP growth rate as an economic pillar of sustainable development, unemployment rate as a social pillar of sustainable development and CO_2 emissions, a proxy of environmental quality as the environmental pillar of sustainable development. In the second scenario, we examined a 50 percent reduction in the cases of COVID-19 on these same indicators of sustainable development and observed the behaviour of these variables in the future.

Results from the simulation analysis indicated that a 50 percent increase in the cases of COVID-19 is simulated to decrease real GDP growth (economic pillar of SD), decrease CO_2 emissions (environmental pillar of SD) and increase the rate of unemployment (social pillar of SD) from the baseline period to the last quarter of year 2021. The result further indicated that a 50 percent decrease in the cases of COVID-19 is simulated to increase real GDP growth, increase CO_2 emissions and decrease the rate of unemployment from the baseline period to the last quarter of year 2021. It is obvious from the simulation analysis that the economic impacts of COVID -19 are huge. First, the level of importance attached to the spread of COVID -19 pandemic on sustainable development indicators since the beginning of this pandemic in December 2019 as announced by the World health Organization (WHO) had considerably increased. Second, the economic costs of the pandemic as projected by the simulation analysis and other impediments to overall economy and market structure are also huge. Thirdly, there are a plethora of other factors besides COVID-19 that constrain improvement in attainment of sustainable development goals. These include trade policy, weak institutions, policy inconsistency and energy policy, particularly oil price which is externally determined among several others. These findings are in agreement with the report by the World Bank (2020) that big corporations are stagnating and small businesses that create much of the employments are closing shops thereby constraining growth in many countries. It was on the basis of the above findings that the paper proffered the following recommendations for policy makers to guide their actions while responding to the uncertainties posed by the global pandemic and in their efforts towards the achievement of sustainable development goals in Nigeria:

1. Focus on sustainable economic growth and development*:* the continued spread of the pandemic may lead to a new round of economic recession and financial collapse. Therefore, the government needs to carry out long-term plan to redevelop the economy and inject new vitality into the economy so as to promote the flourishing of sustainable business models. Enterprises and individuals need new operating models to meet

frequently changing needs and maintain the agility and efficiency of business systems, promote sustainable management to limit the consumption of natural resources.

2. Focus on sustainable urbanization strategies; such as biodiversity protection, energy and water utilization, waste recycling, and economic and social development, suggestions for sustainable environmental development the reduction of human activities has brought positive benefits to the environment in the short term, which provides a theoretical basis for governments to formulate policies. Governments around the world need to take further actions to balance the relationship between economic recession and environmental improvement. The hardest-hit areas of the pandemic, especially the developing countries need to focus on waste management issues. Integrating pandemic preparedness into sustainable development planning and ensuring the interplay between biodiversity, agriculture, and society, would guarantee a sustainable future.
3. Suggestions for sustainable social development: The COVID-19 pandemic shows that all sectors of society should implement advanced technologies to respond to changes. Cooperation between policy makers, health care workers and researchers can build meaningful partnerships, construct disaster-resistant and sustainable human settlements, overcome vaccine racism and distribute vaccines more equitably to low- and middle-income countries.
4. Governments and other partners need to enhance access to basic services and improve health and social protection transfers. And for all of these to be sustainable, there is the need for rebalancing the relationship between nature, climate and economy.

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