ENVIRONMENTAL CHANGES DURING COVID-19 LOCKDOWN: A HOLISTIC REVIEW

*Uyo C. N¹, Iwuji K. M¹, Asoegwu C. R², Uyo N. C³, Acholonu C. A¹ & Ukpe A. E¹

¹Department of Environmental Management, Federal University of Technology, Owerri, Nigeria.

²Nigerian Conservation Foundation, Finima Nature Park Project Site, Bonny Island, Rivers, Nigeria.

³Department of Civil Engineering, Federal University of Technology, Owerri, Nigeria.

Corresponding Author: Uyo, C. N; Email: uyochijioke@yahoo.com

Abstract: As an integral component of human, the environment is affected by every development effort in a particular way. From the very beginning of civilization, human beings gradually started manipulating the nature for their own benefit which has led to the degradation of the environment. As the novel corona virus disease pandemic (COVID-19) hit the world, human life has come to a halt as many Nations shut themselves off from work and other eminent life activities in order to curtail the spread of the virus, this indeed has grim implications for the world. Millions of deaths have occurred, social, economic and religious activities have been affected negatively. On the contrary, since numerous people's activities and industrial operations have been shut off for several months in many parts of the globe, it is anticipated that there would be a rejuvenating process in the Biosphere, the Atmosphere and the hydrosphere. This study reports a holistic review of some aspects of the environment affected during the lockdown.

Keywords: Environmental Changes, Covid-19, Social, Atmosphere, Hydrosphere, Biosphere

1.0 Introduction

The year 2020 ushered in a record outbreak of one of the deadliest viral disease unprecedented to mankind. Previously known as 2019-novel coronavirus (2019-nCoV); this disease COVID-19 was reported from Wuhan, the capital and major business city of Hubei province, China [29]. Ever since then, COVID-19 has continued to be a challenge to global public health, claiming lives and suspending major activities in many nations. The newly emerging SARS related coronavirus designated as SARS-CoV-2 is the third highly pathogenic Beta coronavirus to infect human populations in the twenty-first century [8]. SARS-CoV-2 emerged in Wuhan, China in late December 2019 and has spread to more than 210 countries in every continent on earth except Antarctica. COVID-19 is the first pandemic in history to be caused by a coronavirus [27]. Symptoms exhibited by COVID-19 disease range from fever, cough, respiratory symptoms, shortness of breath, and breathing difficulties [38]. Fatal outcomes can include lower-respiratory tract illnesses, such as pneumonia and bronchitis, or acute respiratory distress syndrome (ARDS) and severe acute respiratory syndrome (SARS) in severe diseases. These complications are more pronounced in patients with underlying health conditions such as cardiopulmonary disease, immuno-compromised individuals, infants and the elderly [3]. The global mortality rate of COVID-19 is currently estimated to be 3.41% [4]. While the huge negative effects of living through the COVID-19 pandemic are obvious – psychological stress, fear, severe global economic losses, overwhelmed health care systems and general disruption of societies – the ongoing pandemic may also have some indirect positive impacts. Virus outbreaks often have large negative impacts on human health [27]; but the shift in some conventional practices and normal way of life may serve as a rejuvenating process for the Earth's Environment, Animals and Human health systems.

Due to the unusual outbreak of COVID-19, almost every big and small cities and villages in the affected countries like China, Taiwan, Italy, USA, France, Spain, Turkey, Iran, Germany, South Korea, U.K, India, Australia and many more, were under partial or total lockdown for a long period of time ranging from a few weeks up to a few months, all local and central administrations worldwide literally put a ban on free movement of their citizens outside their home in order to avoid community transmission [16].

Orders on Social distancing and quarantines resulted to considerable declines in commuting travel as numerous jobs metamorphose to working from home. According to [16], the various religious, cultural, social, scientific, sport, and political mass gathering events like, Hajj, Olympics etc. were cancelled. Various types of industries have not been functioning; all types of travels were cancelled.

Meanwhile, efforts to restrict transmission of the SARS-CoV-2, by restricting the movement may have had outstanding environmental effect. Due to non-functioning of industries, industrial waste emission also may have decreased to a large extent. Vehicles are hardly found on the roads resulting to almost zero emission of green-house gases and toxic tiny suspended particles to the environment. Due to lesser demand of power in industries, use of fossil fuels or conventional energy sources have been lowered considerably.

The widespread quarantines and travel restrictions imposed by several countries have resulted in reduced use of and demand for oil and its products, which have resulted in reduced emissions of smoke and waste due to oil consumption. For example, the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA) recently reported that nitrogen

dioxide air pollution has been significantly reduced in connection with the community quarantine and lockdown in Wuhan and other cities in China [1]. The Centre for Research on Energy and Clean Air also reported that CO₂ emissions in China were down 25% in the two weeks following the Chinese New Year holiday [22]; Ecosystems are being greatly recovered. In many big cities the inhabitants are experiencing a clear sky devoid of heavy smog for the first time in their lives, the pollution level in tourist spots such as forests, sea beaches, and hill areas is also shrinking largely, and Ozone layer may have revived to some extent as a result of this development [16]. The pandemic has displayed its contrasting consequence on human civilization, in the sense that, on one hand it inflicted a calamity of the century on mankind (especially with regards to the mortality records harvested from the development and also the economic meltdown it imposed on many nations of the world), but created a very positive impact on the world's environment on the other hand.

Confirmed global coronavirus cases now past 16 million, and still rising fast

Source: Johns Hopkins University, national health agencies, data up to 27 July

BBC

Fig.1

2.0 Aspect of Climate and Physical Environment (On the Environmental Medium)

2.1 On Climate

While these developments have inflicted substantial economic and social shocks as global production, consumption and employment levels dropped precipitously, they have also been associated with significant reductions in air pollution and greenhouse gas emissions [28].

Climate experts predict that greenhouse gas (GHG) emissions may have dropped to proportions never before seen since World War II [11]. This outcome is mainly due to the social distancing policies adopted by the governments following the appearance of the pandemic.

For example, in Hubei province (China), strong social distancing measures were implemented in late 2019. These measures affected the country's main economic activities. As a result, power plants and industrial facilities halted their production. Also, the use of vehicles decreased considerably. All this led to a dramatic reduction in the concentrations of Nitrogen Dioxide (NO_2) and Particulate Matter that have a diameter of less than $2.5 \mu\text{m}$ (PM 2.5) in the main Chinese cities [9] (Fig.2).

Fig.2: Evolution of NO_2 Concentrations in China. Source: ESA (2020a)

The emissions of carbon dioxide certainly will decrease as a result of the lockdown rules set by most countries. Some of the largest emitters of carbon dioxide are the trucks, automobiles and airplanes. While many trucks are still needed, automobile and air traffic has decreased considerably. For example, reports show that air pollution from nitrogen oxide, another transportation pollutant, has decreased significantly in China [23]. A comparable reduction in carbon dioxide emissions also should result in India. Similar reductions across other industrial countries should decrease carbon emissions worldwide [23], and should this pattern continue for an extended period, it may consequently present some positive significant contributions to our climate change struggle.

2.2 On Air Quality

Air quality is essential for people's health; however, 91% of the world population lives in places where poor air quality exceeds the permissible limits [36]. The consequences of air quality degradation are manifested in a significant percentage of global mortality each year [26]. In this regard, the 2016 World Health Organization (WHO) report indicates that air pollution contributes to almost 8% of total deaths in the world; the most affected countries being those found in Africa, Asia and part of Europe [37].

Fig. 3: Change in NAQI in the (National Capital Territory) NCT Delhi during 3rd March to 14th April 2020. Source: Mahato et al., 2020

Spatial pattern of National Air Quality Index (NAQI) for the pre-lockdown and during-lockdown period

According to [34], figure 3 depicts the pattern of variation in air quality during pre-lockdown and post-lockdown days between 3rd March and 14th April 2020. The lockdown started on 24th of March and just after 1 day of the commencement of lockdown (i.e. 25th of March) there is significant improvement in the air quality (Fig. 3e) in comparison to that of the pre-lockdown

phase. As much as about 51% reduction of NAQI has been observed on the 4th day (i.e. 27th of March) of lock down (Fig. 3f) in comparison to the 3rd preceding day (i.e. 21st March) of the lockdown (Fig. 3d). On an average there is about 43% decrease in NAQI during the 3-week lockdown period (from 24th of March to 14th of April) in comparison to the average NAQI during the first three week of March (from 3rd March to 21st March). About 54%, 49%, 43%, 37% and 31% reductions in NAQI are observed in Central, Eastern, Southern, Western and Northern regions of the NCT Delhi respectively. This diminution in NAQI is primarily associated with the alteration of prevailing pollutants, primarily PM₁₀, PM_{2.5}, NO₂ and CO₂ necessary transportation and controlled industrial activity outside the COVID-19 infected areas results slight increase in NAQI on the 7th April and 14th April (Fig. 3h and i).

2.3 On Beaches and Water bodies

Beaches are one of the most important natural capital assets found in coastal areas [39]. They provide services (land, sand, recreation, and tourism) that are critical to the survival of coastal communities and possess intrinsic values that must be protected from overexploitation [19]. However, non-responsible use by people has caused many beaches in the world to present pollution problems [25].

The lack of tourists, as a result of the social distancing measures due to the novel coronavirus pandemic, has caused a notable change in the appearance of many beaches in the world, for example, beaches like those of Acapulco (Mexico), Barcelona (Spain), or Salinas (Ecuador) now look cleaner and with crystal clear waters [20]. Apart from this, many receiving waters and some other territorial waters may have seen a period of self-purification and cleansing as a result of the decrease in the rate of their pollution, following the halt of most industrial practices that release process and wastewaters into them.

2.4 On Soil and Terrestrial Environment

Just like the other mediums of the environment have been positively affected by the lockdown, the soil has also received fewer loads of wastes. However, it is important to note that while the rate of contamination of the soil with industrial wastes has dramatically reduced; household and medical wastes have taken over the place of industrial wastes. The rates of harvest of Biodegradable household and medical wastes during these periods have tripled following the lockdown measures effected. It's relatively easy for biodegradable wastes to be degraded and assimilated by the environment, however the quantity and rate at which they are expelled may present some stress to the natural resilience of the environment. Some medical wastes may be toxic or worse still radioactive and as such may add to the load of pollutants in the environment.

2.5 On Vegetation (Biota)

Since production and consumption rate of raw materials were adversely affected from the lockdown measures imposed by the governments of majority of nations with regards to the outbreak of the pandemic; one cannot be faulted to assume that trees and vegetation will be rejuvenated as an effect of this measure. Many lumbering activities that led to the mass production of timber, furniture, books, etc. have been halted as a result. Local farmers and other land owners in developing countries have resorted to cultivating some food crops on their own during these periods rather than going on a spending spree of basic food items with the little amount of money they have left. All these have helped to revitalize and rejuvenate the

environment by increasing vegetative covers and maintaining trees which happens to be one great component of environmental sustainability as a result of its carbon sequestration capacities.

2.6 On Wildlife and Aquatic Populations (Biota)

Demand for fish and fish prices have both decreased due to the pandemic [18], and fishing fleets around the world sit mostly idle [30]. German scientist “Rainer Froese” has said the fish biomass will increase due to the sharp decline in fishing, and projected that in European waters, some fish such as “herring” could double their biomass [18]. As people stayed at home due to lockdown and travel restrictions, some animals have been spotted in cities. Sea turtles were spotted laying eggs on beaches they once avoided (such as the coast of the Bay of Bengal), due to the lowered levels of human interference and light pollution [41]. Apart from all these the rate of road kills during these extended lockdown periods have dramatically decreased and endangered species may find their way back to their long-lost habitats. The rate at which bush meats are being poached by intruders may record a massive decline as a result of the lockdown thus increasing their longevity and reproduction.

3.0 Aspect of Social Environment

3.1 On population

Excessive population growth also should show some positive effects. According to [23], world population has had a net increase of about 10 million people every six to seven weeks, with the increase in the death rate due to the coronavirus, the population growth should slow down. Also, with so many countries having lockdowns of a few months, unwanted pregnancies also should decrease.

3.2 On Schools

The Covid-19 pandemic has affected educational systems worldwide, leading to the near-total closures of schools, universities and colleges [14]. Most governments around the world have temporarily closed educational institutions in an attempt to contain the spread of Covid-19 [15].

As of 7 June 2020, approximately 1.725 billion learners are currently affected due to school closures in response to the pandemic. According to UNICEF monitoring, 134 countries are currently implementing nationwide closures and 38 are implementing local closures, impacting about 98.5 percent of the world's student population. 39 countries' schools are currently open [7].

School closures negatively impact student learning outcomes [12]. When schools close, parents are often asked to facilitate the learning of children at home and can struggle to perform this task. This is especially true for parents with limited education and resources [17]. Schools are also hubs of social activity and human interaction. When schools are closed, many children and youth miss out of on social contact that is essential to learning and development [31].

Learners affected by school closures caused by COVID-19 as of 7 June 2020

Fig 4 Source: https://en.wikipedia.org/wiki/Impact_of_the_COVID-19_pandemic_on_education

Furthermore, as daily life activities grind to a halt worldwide in response to the Corona virus disease 2019 (Covid-19) pandemic, professionals and the academic are adjusting to a new reality of remote working, this would obviously mean more time for independent work as they are relieved from teaching and other administrative activities. With the travel restrictions and bans globally, it would be very difficult for an academic to survive, an academic is recognized in the international community (globally) only when he travels outside the shores of his country, travelling in this regard gives him new knowledge and perception, there must have to be exchange of ideas, interests and interaction with people of other nationals and climes.

Most countries as a result of the pandemic have locked their borders and may refuse to open it for nationals of some particular countries, eventually, if the emerging online method of teaching, learning and acquiring degree thrives, many countries would offer online courses (With students getting their degrees online) by using the old method of correspondence, thereby preventing students of mostly developing countries (annex 2) from travelling to developed countries (annex 1), with this, there would never be opportunity and honor of interacting with foreign students, academic professionals, meeting them in class, learning from them etc. At the

end of it all, one would acquire knowledge, but the social component of that knowledge would be lost.

3.3 On Family Health

Being forced to stay at home has brought the family members together. They are forced to talk, eat and play together every day, which was not possible for some families due to the demands from work and several other responsibilities. Often times, some of these children had to only meet their parents weekly or fortnightly as a result of their various commitments. Hence, the lockdown is good for family health, bonding, unity and togetherness [35]. It will also promote the longevity of the family and couples on a long run.

3.4 On Sports

The Covid-19 pandemic has caused the most significant disruption to the worldwide sporting calendar since World War II, across the world and to varying degrees, sports events have been cancelled or postponed [5][13][6]. The 2020 summer Olympics in Tokyo were rescheduled to 2021. Spectators have no games to watch and players no games to play [31].

4.0 Aspect of Spiritual Environment

4.1 On Religion

The Covid-19 pandemic has impacted religion in various ways, including the cancellation of the worship services of various faiths, the closure of Sunday Schools, as well as the cancellation of pilgrimages surrounding observances and festivals [2]. Many churches, synagogues, mosques, and temples have offered worship through live stream amidst the pandemic [24]. Adherents of many religions have gathered together to pray for an end to the COVID-19 pandemic, for those affected by it, as well as for wisdom for physicians and scientists to combat the disease [32] [33].

An American Catholic military chaplain prepares for a live-streamed Mass in an empty chapel at Offutt Air Force Base in March 2020.

Fig 5 Source: https://en.wikipedia.org/wiki/Impact_of_the_COVID-19_pandemic_on_religion

5.0 Other Aspects

5.1 On Environmental Noise

Environmental noise is defined as an unwanted sound that could be generated by anthropogenic activities (for instance, industrial or commercial activities), the transit of engine vehicles, and melodies at high volume. Environmental noise is one of the main sources of discomfort for the population and the environment, causing health problems and altering the natural conditions of the ecosystems [40].

The imposition of quarantine measures by most governments has caused people to stay at home. With this, the use of private and public transportation has decreased significantly. Also, commercial activities have stopped almost entirely. All these changes have caused the noise level to drop considerably in some cities in the world [21]. However, the case may slightly be different in some third world countries; this is because many homes in developing nations rely on the use of standby generators as their major power source owing to the inconsistency of power supply. Thus, while noise levels are significantly reduced in developed nations, the difference is the case around the residential areas of many upcoming nations.

Conclusion and Recommendation

Humans exist within a complex system of interconnected elements of life; each of these systems plays an important role. When one element is altered or separated, the whole system is affected and can result to favorable or dissenting effects. However, nature prevents and responds to numerous greatest challenges faced by humans today. The review has confirmed that with the Covid-19 pandemic, the environment is recovering and the economy and social aspect of the environment is shrinking. The epidemic has achieved positive environmental effects, the level of pollution has decreased significantly throughout the world, the surface water resources has become clear, pure and less polluted, the excessive world population growth is decreasing as a result of deaths, family health is improving. The soil has received less load of pollution, vegetative covers have been on the increase, the rate of harvest of aquatic organisms and poaching of wildlife respectively have reduced drastically. The face of academia at all levels (Primary, secondary and tertiary) can never be the same again as teachers would now have divided attention and loyalty on the account of closure of schools with disruptions in sporting and religion events and activities.

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