LEGAL CONTROL OF AIR POLLUTION: AN IMPERATIVE FOR SUSTAINABLE INDUSTRIALIZATION IN AFRICA[1]*

Abstract

Industrialization obviously holds the prospects of a better economy for Africa. It provides employment and goods to the teaming population of the continent and so combats poverty. But these prospects are greatly threatened if air pollution associated with industrialization is not checked. Air pollution causes among other things nasal, eyes and airway irritation, and even lung and heart problems. Studies show that air population is currently responsible for more deaths in Africa than malnutrition or dirty water. The methodology of the paper is doctrinal and the approach is expository. Thus, this paper inquired into the legal regime for air quality enhancement and air pollution control in Africa. Environmental pollution control is to a good extent tied to economy to the effect that wealthier nations are endowed with greater capabilities for more effective pollution control. From this background this paper focuses on the legal regimes air pollution control in the four leading economies in Africa: Nigeria, South Africa, Egypt and Ethiopia. The paper examines the international legal instruments on air pollution control ratified by African countries in general and the municipal regimes of these four economies on air pollution control. Air pollution has deleterious effects on human health. The legislations especially in Nigeria are rarely enforced and effective. Economic development is not complemented with adequate environmental protection and particularly, air pollution control and thus not sustainable. The recommendation is that African countries should go beyond creating the legal and institutional regimes on air pollution control to seeing that these regimes are effectively operative. The methodology of the paper is doctrinal.

Keywords: Air pollution, Legal control, Sustainable industrialization, Africa

1. Introduction

Industrialisation is adjudged as one significant way of leading Africa out of its almost cycle of poverty. It can do this by enhancing the manufacturing sector which will process the vast and rich natural resources of Africa. This will create employment to the teaming and young population of Africa with the resultant effect of improving standard of living and wellbeing. While industrialisation comes with this positive promise, there is a down side to it. It comes with heavy air pollution that bears adverse effects on human health, the ecosystem and the environment on which humankind depends. For instance, energy for the industries is often from the burning of fossil fuels like diesel and gas, which emit greenhouse gases (GHGs) that are responsible for global warming. Dust and particulate matters that come with housing developments and civil engineering works associated with industrialisation pollute the air also. Oxides of Sulphur and Nitrogen which are emitted by the burning of fossil fuel are responsible for acid rain. Amongst the health challenges from polluted air are nasal, eyes and airway irritation, and even lung and heart problems. This makes the mere fact of industrialisation a mixed-grill of the good, the bad and the ugly. The employment and increased income that go with it account for its good side while the ecosystem, health and environmental hazards that accompany it account for the bad and ugly sides of it. To make the good sides of the it sustainable it is important that they bad and ugly sides are controlled. One way of doing this is through the legal control of air pollution. Given that the effective control of air pollution entails the use of modern technologies which are not generally cheap, wealthy countries are better placed to confront the demands of air quality enhancement and air pollution control. It is on account of this that this paper focuses on the four leading economies in Africa: Nigerian, South Africa, Egypt and Ethiopia in assessing the legal regime for air pollution control in Africa. The paper is divided into six parts. After the first part, which is the introduction, follows the second part in which the key concepts in the paper are explained. These are air pollution and industrialisation. The third part discusses industrialisation as the catalyst for economic development of Africa. The fourth part discusses the challenge of industrialisation-induced air pollution. The fifth part examines the legal response of Africa in the face of industrialisation-associated air pollution. This part is subdivided into three. The first sub-part examines key worldwide treaties on air pollution control that African countries generally ratified. The second sub-part assesses African regional treaties on the subject of air pollution control. The last sub-part examines the municipal legal instruments of Nigeria, South Africa, Egypt and Ethiopia on the air pollution control. Part six is the conclusion and

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recommendations. The finding is that effective enforcement is required in order to make the legislations really effective.

2. Explanation of Key Concepts

One key concept in this paper is air pollution. Gundling defined air pollution as 'the introduction by man, directly or indirectly, of substances or energy into the air resulting in deleterious effects of such a nature as to endanger human health, harm living resources, ecosystems and material property, and impair or interfere with amenities and other legitimate uses of the environment.'[2] The Organization for Economic Cooperation and Development (OECD) sees it as'the presence of contaminant or pollutant substances in the air that do not disperse properly and that interferes with human health or welfare, or produces other harmful environmental effects.'[3] OECD's definition says nothing about the sources of the contaminant substances unlike Gundling's definition that points out that the pollutants come from man. It sees air pollution simply as the presence of contaminant or pollution substances in the air regardless of it source. Contaminant substances in the air broadly come from two sources: natural and human. Natural pollutant substances are those air pollutants that occur independent of human agency, but simply through the forces of nature. An example is sulphur dioxide pumped into the air by active volcanoes. Human sources, otherwise called anthropogenic sources, of air pollution refer to human activities which directly or indirectly emit air pollutants. Gundling's definition represents a narrow conception of air pollution because it represents air pollution resulting only from human sources. Due to the fact this paper is talking of industrialization, which is undoubtedly a human activity, air pollution in this paper is discussed in the context of anthropogenic air pollution. Air pollution is a type of environmental pollution. Other types of environmental pollution include land pollution and water pollution.

Another key word is 'industrialization'. The Merriam-Webster Dictionary defines it as 'the widespread development of industries in a region, country, culture, etc.'[4] The Oxford English Dictionary defines it as 'the development of industries in a country or region on a wide scale.'[5]The term 'industry' has several nuances that are not completely different or opposed. The Oxford Advanced Learner's Dictionary defines it first as the production of goods from raw materials, especially in factories.[6] Second, it means the people and activities involved in producing a particular thing or in providing a particular service.[7] Third, it means equally the quality of working hard.[8] The first nuance of the term industry stands for the factory processes involved in transforming raw materials to finished products. It must be pointed out that the idea of a finished product is relative. What constitutes a finished production in one factory may become a raw material for another factory. The second nuance is related to the first in that it relates to activities involved in producing a particular thing. But it differs from the first because it embraces the people involved in the production of goods. It also differs from the first because it points to the fact that what is produced is not only good, but it also provides services. What is central to all these nuances is that an industry involves the production by human beings of goods and services. Consequently, industrialization means the widespread establishment of factories and other such facilities where for people to engage in processes geared towards the production of goods and services. The indispensability of these goods and services for good life make industrialization an important activity in the economic development of a country or continent. All these perceptions notwithstanding this paper moves with the working definition of an industry as a factory where human beings engage in processes and activities for the purpose of producing goods and providing services. These processes and activities involve advanced technologies.

3. Industrialization: Catalyst for Economic Development in Africa

Economic development has different definitions from different scholars and organizations. *Salmon Valley Business & Innovation Center* sees it from policy perspective as 'efforts that seek to improve the economic well-being and quality of life for a community by creating and/or retaining jobs and supporting or growing incomes and the tax

[2] L Gundling, *International Environmental Law: Atmosphere, Freshwater and Soil*, (Switzerland: UNITAL, 1998), p. 6; 1979 Convention on Long Range Transboundary Air Pollution, art. 1(a).
[3] OECD, 'Air Pollution'(1997),https://stats.oecd.org/glossary/detail.asp?ID=86, accessed 22 October 2019.
[4] Merriam-Webster Dictionary, 'Industrializaion', https://www.merriam-webster.com/dictionary/industrialization, accessed 22 October 2019.
[5] Oxford English Dictionary, 'Industrialization', https://en.oxforddictionaries.com/definition/industrialization, accessed 22 October 2019.
[6] Ibid.
[7] Ibid
[8] Ibid.

base.'[9] For Encyclopedia Britannica, it is 'the process whereby simple, low-income national economies are transformed into modern industrial economies.'[10] The history of the pivotal importance of industrialization for economic development goes back to industrial revolution that began in Britain in the late 1700s and which saw birth of factory-based production. Before this time productions were done in people's homes, using hand tools or basic machines. Industrialization introduced a shift to powered, special-purpose machinery, factories and mass production.[11] This contributes enormously to the economic development of a country. With industrialization there is optimum utilization of scarce resources. It enhances the quality and quantity of the manufacturing sector. It also increases the national income of a country. Furthermore, industrialization increases the production of goods and services and labour receives higher wages. When the income of workers increases, their living conditions and standards also improve. Industrialization also benefits government because it increases industrial production, exports and government revenues. In summary, economic development is a process out of poverty, and industrialization is a key driver of the process.

It is for this that industrialization has been posited, and correctly too, as a key to the economic development of Africa. The statistics on economic development in Africa generally paints a dismal picture of poverty when compared with the statistics on development in developed countries in Europe and North America. Headings like *Ending Poverty in a Rising Africa*,[12]*While Poverty in Africa Has Declined, Number of Poor Has Increased*,[13] and *Africa: Poverty in Africa - the Staggering Figures and the Hope*[14] say it all on the level of poverty in Africa. There are worse headings but these express some commitment in fighting the scourge of poverty and slow development. The poverty situation is worsened by the significant growth in population in the region. In 2017, with a population of 1.24 billion, Africa had 16.5 % of the world population.[15] In 2018 the population rose to 1.27 billion, amounting to 16.7% of the global population.[16]

Major hope in rising out of the poverty situation of Africa lies in industrialization. With industrialization the many natural resources will be processed locally thereby creating employment, better income and improved standard of living for Africans. The United Nations Industrial Development Organization (UNIDO), in its *Report on the Development Need of Africa and Least Developed Countries*, to the G20 Summit in China in September 2016 highlighted industrialization as a way out. A similar advocacy was made by the African Development Bank (AfDB) when it wrote:

> Africa is a land of opportunity. The continent is well endowed with natural resources necessary for a resource-based industrialization. The continent is sitting on more than US$82 trillion in discovered natural resources, with the potential to contribute US$30 billion a year in government revenues over the next 20 years. Africa also possesses other natural resources – minerals, rivers, forests, fisheries, etc., in vast quantities worth significant amount. The value added of its fisheries and aquaculture alone is estimated to be more than US$24 billion.[17]

Mbae wrote: 'Without strong industries to create jobs and add value to raw materials, African countries risk remaining shackled by joblessness and poverty.'[18] Sustaining his call for industrialization in Africa, Mbae cited the

[9]'What is Economic Development?', http://www.svbic.com/node/24, accessed 23 October 2019
[10]'Economic Development', https://www.britannica.com/topic/economic-development, accessed 22 October 2019.
[11]'Industrial Revolution', https://www.history.com/topics/industrial-revolution, accessed 22 October 2019.
[12]The World Bank, 'Ending Poverty in a Rising Africa', (2015), http://www.worldbank.org/en/news/feature/2015/10/16/ending-poverty-in-a-rising-africa, accessed 23 October 2019.
[13] The World Bank, 'While Poverty in Africa Has Declined, Number of Poor Has Increased', (2016), http://www.worldbank.org/en/region/afr/publication/poverty-rising-africa-poverty-report, accessed 23 October 2019.
[14]'Africa: Poverty in Africa - the Staggering Figures and the Hope', (2017), http://allafrica.com/stories/201707170913.html, accessed 23 October 2019.

[15]Worldometers, 'African Population (live)', http://www.worldometers.info/world-population/africa-population/, accessed 24 October 2019.
[16]Ibid.
[17]AfDB, 'Why does Africa's industrialization matter? Challenges and opportunities?', (2017), https://www.afdb.org/en/news-and-events/why-does-africas-industrialization-matter-challenges-and-opportunities-17569/, accessed 13 June 2018.
[18]L. Mbae, 'Industrialization in Africa: Can the Continent Make It?', (2014), http://www.tonyelumelufoundation.org/articles/industrialization-africa-can-continent-make/, accessed 13 October 2019.

absurd situation in Nigeria where, Nigeria, the world's sixth-largest producer of crude oil, exports more than 80% of its oil but cannot refine enough for local consumption.[19] It spends billions of United States' dollars subsidizing the importation of petroleum products. He also cited the cases of Côte d'Ivoire and Ghana which produce 53 percent of the world's cocoa. Yet the supermarket shelves in Abidjan and Accra, their respective State capitals, are stacked with chocolates imported from Switzerland and the UK, countries that do not farm cocoa.[20]

While the call for industrialization is heightening, it is important to raise at the same time and in the same breath the alarm on air pollution associated with industrialization. This is necessary in order for the industrialisation to be also in conformity with the UN 2030 Agenda for Sustainable Development with respect to environmental sustainability. This is particularly germane as there are signs that the clarion call for industrialization is being heard in the continent. Mauritius, a tiny African country on the Indian Ocean, is recognized amongst economists as a country that has steadily moved in the direction of industrialization. Headings like *Export-processing industrialisation in Mauritius: The lessons of success*,[21]'*The economic success of Mauritius: lessons and policy options for Africa*,[22] indicate this. Other sub-Saharan countries so recognized include South Africa and Botswana.[23] Currently Dangote is building a refinery in Lagos, Nigeria, to turn around the sad irony of Nigeria importing what it exports. Ghana has signaled interest in importing petroleum products from Nigeria when the refinery becomes operational.[24] Limestone in Nigeria is being mined and processed for the production of cement in the country. Nigeria today is self-dependent on cement production and is exporting the item.[25] Unless air pollution associated with industrialisation is controlled and controlled from the onset of the industrialisation scheme, it may undermine the benefits of industustrialisation.

4. The Challenge of Industrialisation-induced Air Pollution

Technological processes that go with industrialization often come with air pollution. For instance the mining and production of crude oil in Nigeria has resulted in gas flaring which injects into the air oxides of Sulphur and Nitrogen which cause acid rain. The improved living standard that comes with industrialization also has negative effects on the environmental air quality. For instance, the civil engineering and building works that go with establishing modern housing developments throw up dust and other particulate matters into the air. With improved living standard, people produce more solid wastes. Decomposing solid wastes emit methane which pollutes the air as a greenhouse gas (GHG). Vehicles we use, which are hallmarks of improved living standard, runon diesel and petrol, and so emit nitrogen oxide which is a GHG. The environment is the surrounding space within which human beings live and within which industrialization itself takes place. If it is not well protected while industrialisation is going on, it would not be able to withstand industrialisation. This takes the paper to discuss the sources and effects of air pollutants.

Air Pollutants: Causes and Effects

From the perspective of where the air pollution is occurring, it can be classified into indoor and outdoor air pollution. Indoor air pollution occurs in enclosed areas like homes and offices.[26] Outdoor air pollution occurs in open places, such as in gas flaring and bushfires.[27] On the other hand, air pollutants, from the perspective of substance,are classified into particulate matter and gases. Particulate pollutants include solid airborne particles such

[19] Ibid.
[20] Ibid.
[21] CM Rogerson, 'Export-processing industrialisation in Mauritius: The lessons of success', (1993) 10(2) *Development Southern Africa*, 177-197.
[22] S K Sobhee, 'The economic success of Mauritius: lessons and policy options for Africa', (2009) 12(1) *Journal of Economic Policy Reform*, 29-42.
[23] T. Moyo, 'Promoting Industrialisation in Mauritius, South Africa and Botswana: Lessons for the Future', (2016) XLI(3) *Africa Development*, 139-163.
[24] 'Ghana, Others To Import Petroleum Products From Dangote Refinery', https://independent.ng/ghana-others-to-import-petroleum-products-from-dangote-refinery/ ,*Independent*, 24 October 2019.
[25] 'Dangote Helps Nigeria Attain Self-Sufficiency in Cement Production', http://venturesafrica.com/dangote-helps-nigeria-to-attain-self-sufficiency-in-cement-production/, accessed 24 October 2019.
[26] 'What Is Indoor Air Pollution? - Definition, Sources & Effects', https://study.com/academy/lesson/what-is-indoor-air-pollution-definition-sources-effects.html, accessed 22 October 2019.
[27] 'Outdoor Air Pollution', http://www.health.nsw.gov.au/environment/air/Pages/outdoor-air-pollution.aspx, accessed 20 June 2018.

as dust, fly ash, smoke, fog, soot, and fumes.[28] Gaseous pollutants include carbon monoxide, carbon dioxide, hydrocarbons, oxides of sulphur, and oxides of nitrogen.[29] Oxides of suphur are sulphur oxide (SO) and sulphur dioxide (SO_2) while oxides of nitrogen are nitrogen oxide(NO) and Nitrogen dioxide (N_2O).

Even though carbon dioxide is emitted by human beings when breathing, it is generally seen as a pollutant when it is emitted by cars, planes, power plants, and other human activities that involve the burning of fossil fuels.[30]It is considered that carbon dioxide exhaled by human beings and other animals cannot distort the natural atmospheric carbon dioxide equilibrium because they are taken by plants and vegetation. Instances of fossil fuels are coal, gasoline and natural gas. Nitrogen, ordinarily, is a significant part of the air. Under high temperature, it reacts with the atmospheric oxygen to form Nitrogen oxide, which reacts further with atmospheric oxygen to form Nitrogen dioxide. Nitrogen oxide is further emitted into the air by the burning of fossil fuels.[31] Like Nitrogen oxide, sulphur dioxide pollution comes from the burning of fossil fuels.[32] Nitrogen oxide and sulphur dioxide under humid conditions form nitric acid and sulphuric acid respectively. Carbon monoxide (CO) is a colorless, tasteless and odorless gas that is produced from the incomplete combustion of fossil fuels and wood.[33] Hydrocarbons are compounds containing hydrogen (H) and Carbon (C). An example is methane (CH4).

Sulphur dioxide in the air causes smog which is dangerous for people with respiratory problems (e.g. asthmatic patients), people with heart conditions, aged people and children.[34] By sulphur dioxide and nitrogen oxide forming sulphuric acid and nitric acid respectively, they are responsible for acid rain. Acid rain is responsible for high corrosivity of metal and structures in affected areas. It leads also to the acidity of both surface and ground water. It also harms soil nutrients thereby leading to poor agricultural harvest. In Nigeria this is particularly the case in the Niger Delta area where gas flaring has been going on for decades. Carbon monoxide can be harmful to life when inhaled in large amounts by reducing the amount of oxygen in the blood stream to important organs like the heart and brain. If inhaled in a high level, carbon monoxide can lead to dizziness, unconsciousness and death.[35] A significant source of outdoor anthropogenic carbon monoxide pollution is vehicular traffic. Hydrocarbons are compounds containing hydrogen (H) and Carbon (C). An example is methane (CH4). Many industrial processes involve hydrocarbons and their compounds. Hydrocarbons are greenhouse gases (GHGs) which cause global warming. Halogenated hydrocarbons like Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs) are compounds of hydrocarbons and are ozone-depleting substances (ODS). They come from sources like refrigerants, fire extinguishers, solvents for cleaning and agricultural fumigants.[36] Methane comes, for instance, from solid waste dumps and livestock.[37]Due to the fact that the deleterious effects of air pollution, like the harmful effects of other kinds of environmental pollution and degradation, are long lasting and transboundary, the international community has come up with regulatory mechanisms for controlling air pollution. These mechanisms set the part that industrialization should to take in Africa in order for it to not be counterproductive.

5. Legal Regime for Air Pollution Control in Africa

[28]National Geographic Society, Global Warming, <https://www.nationalgeographic.org/encyclopedia/global-warming/> accessed on 22 October 2019.
[29]Ibid.
[30]National Geographic Society, 'Air Pollution', <https://www.nationalgeographic.com/environment/global-warming/pollution/> accessed on 22 October 2019.
[31]United States Environmental Protection Agency, 'Nitrogen Dioxide (NO2) Pollution',<https://www.epa.gov/no2-pollution> accessed on 22 October 2019.
[32]United States Environmental Protection Agency, 'Sulfur Dioxide (SO2) Pollution', <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics> accessed on 22 October 2019.
[33]United States Environmental Protection Agency, 'Carbon Monoxide (CO) Pollution in Outdoor Air', https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#What%20is%20CO, accessed on 22 October 2019. Texas Commission on Environmental Quality, 'Air Pollution from Carbon Monoxide,https://www.tceq.texas.gov/airquality/sip/criteria-pollutants/sip-co, accessed 22 October 2019.
[34]'Air Quality Information for Sacrament Region', http://www.sparetheair.com/health.cfm?page=healthoverall, accessed on 22 October 2019.
[35]United States Environmental Protection Agency, (n. 53).
[36]'Ozone depleting substances (ODS)', http://www.environment.gov.au/protection/ozone/ozone-depleting-substances, accessed on 22 October 2019.
[37] RO Yusuf, ZZ Noor, *et al*., 'Greenhouse Gas Emissions: Quantifying Methane Emissions from Livestock', (2012) 5(1) *American J. of Engineering and Applied Sciences,* 1-8.

African countries are parties to worldwide multilateral treaties on air pollution control and they derive air pollution control obligations from these international agreements. They also derive obligations from regional multilateral treaties negotiated amongst them and from municipal legislations.

Worldwide Multilateral Conventions on Air Pollution Control

i. United Nations Framework Convention on Climate Change (UNFCCC) 1994

This is a worldwide treaty, **ratified by** 196 States and which entered into force on 21st March 1994.[38] With practically all the member States of the United Nations ratifying, it is ruled out that all African States did not ratify it. It requires industrialized countries to make financial and technological transfers to developing countries.[39]Africa countries are developing countries. Impliedly the technologies to be transferred are climate friendly, otherwise they would be counter-productive. Such transfers are also invitations to developing countries to pursue climate friendly technologies. The convention also requires all parties to it – both industrialized and developing countries- to create inventories of GHGs as well as national mitigation and adaptation programs for GHGs.[40] The Convention, however, sets different mitigation timetables for each class of parties[41] in accordance with the principle of common but differentiated responsibility (CBDR).[42] The commitment of all signatories include the duty to 'promote and cooperated in the conservation and enhancement, as appropriate, of sinks and reservoirs of all green-house gases'.[43] GHG sink refers to natural processes that take away GHG from the atmosphere.[44] Examples include raising of vegetation and forestation.

ii. The Kyoto Protocol on the UNFCCC

This treaty aims at the reduction of the current high level of GHG emissions. It was made in Kyoto, Japan, and entered into force on 16 February 2005. As at 2017 it was only South Sudan amongst African countries that had not ratified the treaty.[45] It commits its Parties by setting internationally binding emission reduction targets. However, the binding emission reduction targets are set only for developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity. Developing countries are asked to voluntarily reduce their GHG emissions. The Protocol was later amended in Doha, Qatar in 2012.

iii. Paris Agreement on Climate Change

It resulted from the UN Climate Change Conference held in Paris from 30 November to 12 December 2015. It builds on the UNFCCC. All African countries have ratified it.[46] It commits all signatories to the agreement to specific reduction targets for greenhouse gases. To this effect it requires all countries to prepare nationally determined contributions (NDCs) towards the reduction of greenhouse gases. The agreement also requires countries to submit updated NDCs every five years to the secretariat of the Convention starting from 2020. This is a means of monitoring the progress of parties in the reduction of greenhouse gas emission. However, the Conference of the Parties (COP) invited all parties to communicate to the secretariat their intended natioanally determined contributions (INDCs) well in advance of COP 21 (by the first quarter of 2015 by those parties ready to do so) in a manner that facilitates the clarity, transparency and understanding of the INDCs. By April 2016 a total of 190 parties had communicated an INDC (97% of all parties to the UNFCCC) with a total CO2 coverage of 94.6%. Nigeria submitted in November 2015, South Africa September 2015, Ethiopia June 2015, etc.

[38]United Nations Climate Change, 'Status of Ratification of the Convention', https://unfccc.int/process/the-convention/what-is-the-convention/status-of-ratification-of-the-convention, accessed 22 October 2019.
[39]Artt. 3(2), 4(1)(c), 4(2)-(4).
[40] Art. 4.
[41] Art. 4.
[42] Art. 3(1).
[43] Art. 4(1)(d).
[44]'Sink', https://www.encyclopedia.com/environment/energy-government-and-defense-magazines/sink, accessed 22 October 2019.
[45] Global Climate Change,' Kyoto Protocol', https://globalclimatechangebc.weebly.com/kyoto-protocol.html, accessed 23 October 2019.
[46] M Sampathkumar, 'Syria Signs Paris Agreement – leaving US only country in the world to refuse climate change deal', *Independent*, 7 November 2017, https://www.independent.co.uk/news/world/middle-east/syria-paris-agreement-us-climate-change-donald-trump-world-country-accord-a8041996.html, accessed 23 October 2019.

iv. Vienna Convention for the Protection of the Ozone Layer

This treaty was adopted in 1985 and entered into force on 22nd September 1988. It is another worldwide multilateral treaty and has been ratified by all member States of the United Nations. By this token it is ratified by all African States. The Convention sets general obligations for parties. The obligations include adopting appropriate legislative or administrative measures and co-operating in harmonizing appropriate policies to control, limit, reduce or prevent human activities under their jurisdiction or control should it be found that these activities have or are likely to have adverse effects which result to modification or likely modification of the ozone layer.[47]A remarkable feature of this convention is that its orientation to the protection of the ozone layer is precautionary. There was not yet certainty on the substances that depleted the ozone layer. Hence it talks of substances that are likely to have adverse effects on the ozone layer. A protocol to this convention, the Montreal Protocol on Substances that Deplete the Ozone Layer, introduced certainty on the substances that deplete Ozone. In Annex 1, article 4, it named substances that modify the chemical and physical properties of the ozone layer. They include carbon, nitrogen, Chlorine, bromine and hydrogen substances.

The Montreal Protocol entered into force on 26 January 1989 after it was made on 26 August 1987. It is a worldwide treaty and is ratified by all member States of the United Nations including African countries. In order to fine-tune the Montreal Protocol towards achieving the central goal of the Vienna Convention on the protection of the Ozone layer, eight revisions have been made on it[48] and the last was in 2016 in Kigali, Rwanda. The Kigali amendment was agreed to by the same 197 parties to the Montreal Protocol. It will enter into force on 1 January 2019.[49]The Kigali amendment introduced into the Montreal Protocol the phase-down of hydrofluorocarbons (HFCs) by cutting their production and consumption. HFCs are actually ozone friendly, thus they had been recommended for use as alternative to the ozone depleting substances (ODS). But further research found out that HFCs are greenhouse gases with very high global warming potentials (GWPs). The amendment gives phase-down target dates for different world economies. While the richer countries like the Unites States and those in the European Union will reduce the production and consumption of HFCs by 2019, most of the rest of the countries of the world including China, Brazil and all of Africa will freeze the use of the HFCs by 2024.[50]

African Treaties on Air pollution Control

African regional treaties on air pollution control include African (Banjul) Charter on Human and Peoples' Rights and the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1994), otherwise called Bamako Convention.

i. African (Banjul) Charter on Human and Peoples' Right

Article 24 of the Banjul Charter provides that 'All peoples shall have the right to a general satisfactory environment favourable to their development.' Included in the concept of this satisfactory environment is clean and unpolluted air environment.

ii. Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1994)

Amongst the obligations of parties under this convention is to ensure that the generation of hazardous wastes within the area under its jurisdiction is reduced to a minimum taking into accountsocial, technological and economic aspects.[51] Hazardous waste is defined to include wastes from the production, formulation and use of organic solvents; waste oils/water, hydrocarbons/water mixtures, emulsions; and wastes collected from households, including sewage and sewage sludges.[52]

[47] Art. 2(2)(b).

[48] In 1990 (London), 1991 (Nairobi), 1992 (Copenhagen)], 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal), 1998 (Australia), and1999 (Beijing).

[49]'EU countries trigger entry into force of Kigali Amendment to Montreal Protocol', https://ec.europa.eu/clima/news/eu-countries-trigger-entry-force-kigali-amendment-montreal-protocol_en, accessed 23 October 2019.

[50] UN Environment, 'The Kigali Amendment to the Montreal Protocol: another global commitment to climate change'https://www.unenvironment.org/news-and-stories/news/kigali-amendment-montreal-protocol-another-global-commitment-stop-climate, accessed 24 October 2019.

[51] Art. 4(3)(c).

[52] Annex I

Municipal Legislations in Africa on the Control of Air Pollution

Part of the obligations of parties to international agreements is to take legislative and administrative and administrative steps within their countries in seeing to the fulfillment of the objectives of the treaties. Accordingly the paper in this part examines the legislative and administrative initiatives of Africa countries towards air pollution control within their territories. Given that air pollution control conventions, following the common but differentiated responsibility (CBDR) principle, assign more responsibilities to richer countries, this paper paid particular attention to the legislative and administrative mechanisms in the richer economies of Africa. These are Nigeria, South Africa and Egypt.[53] The paper considers also Ethiopia which is regarded as the fastest growing economy in Africa.[54]

Nigeria:

Key legislations for air pollution control in include the following.

i. Factories Act, 1987

This is an Act to provide *inter alia* for the safety of workers in factories to which the Act applies. Section 7(1)(a) directs that 'accumulations of dirt and refuse shall be removed daily by a suitable method from the floors and benches of workrooms, and from the staircases and passages'. It provides further in section 8(1) that a factory shall not be overcrowded while in operation. It goes further in section 8(3) to give minimum dimension of a workroom in order to avoid overcrowding. A workroom must not be less than 9 feet in height. However, the Act does not specify the width of the room and the maximum number of people that can be in a specified room in order to avoid overcrowding. The Act requires in section 9(1) that there should be effective and suitable circulation of fresh air in each workroom.

ii. **Associated Gas Re-Injection (Amendment) Act, 1979**

This is an Act to compel every company producing oil and gas in Nigeria to submit preliminary programmes for gas reinjection and detailed plans for implementation of gas re-injection. In section 3 it prohibits, with effect from 1st January 1984, all companies engaged in the production of oil or gas to flare gas produced in association of oil without the written permission of the Minister in charge of oil and gas. The permission of the minister for a continuance of gas flaring after this date is subject to fees for a certain amount of gas flared. In spite of this legislation, gas is still flared in the country.

iii. Environmental Impact Assessment (EIA) Act, 1992

The aims and objectives of the Act include to establish, before a decision is taken for any activity to be undertaken, those matters that may likely or to a significant extent affect the environment or have an environmental effect shall first be take into account.[55] In other words, the Act seeks to ascertain in advance the environmental effects of a planned project with a view to determining whether the project should go ahead or not. If the project should go ahead in spite of the negative environmental impact, measures would be put in place to contain the negative environmental impact. The EIA statement required by the Act for the grant of a mining lease or license, for instance, includes information on the effluent air discharge from the project to the environment.[56]

iv. Minerals and Mining Act 2007

Chapter Four of the Act deals with environmental considerations in mining activities. Section 119 under this chapter requires every holder of a minerals and mining lease to take certain steps for air pollution control prior to commencing operations. The steps include submitting to the Mines Environment Compliance Department (MECD) of the ministry of mines an EIA statement. The document will state the air quality conditions of the project area if the project were to go on. If the effect is not good, measures for remedying it must be stated.

v. National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991

[53]'The Biggest Economies In Africa', https://www.worldatlas.com/articles/the-biggest-economies-in-africa.html, accessed 24 October 2019.

[54]'Ethiopia is Africa's fastest-growing economy',https://www.weforum.org/agenda/2018/05/ethiopia-africa-fastest-growing-economy/, accessed 24 October 2019.

[55]Environmental Impact Assessment Act, Cap E12, LFN 2004, s. 1(a).

[56] Minerals and Mining Regulations 2011 (hereafter referred to as MMR), reg. 160(3)(i)(k).

This is a regulation made by the Minister in charge of the environment pursuant to section 34 of the NESREA Act. Its goal is to ensure that no industry or facility in Nigeria releases hazardous or toxic substances into the air beyond the limits approved by the NESREA.[57] It sets out measures for achieving this goal. It provides, for instance, that every industry or facility shall have a pollution monitoring unit within its premises.[58] Every industry or facility shall also have on site a pollution control unit or assign the responsibility for pollution control to a person or body corporate accredited by the NESREA.[59] It must be pointed out that the pollution monitoring units and pollution control unit of an industry should be regularly monitored by NESREA in order to see that they keep to the set standard. Apart from legislations, two major national institutions see to the enforcement of the air pollution control legislations in the Nigeria. They are the National Environmental Standards and Regulations Enforcement Agency (NESREA) and the National Oil Spill Detection and Response Agency (NOSDRA).[60] While the latter is only of the oil and gas sector, the former is for all other sectors of country. The NESREA was established in 2007[61] to replace the erstwhile Federal Environmental Protection Agency (FEPA) that was established in 1988.[62] Concerning air pollution control the functions of NESREA includes enforcing compliance with provisions of international agreements, municipal policies, legislations, and guideline on hazardous waste, ozone depletion, environmental health and sanitation, pollution abatement, and air quality.[63] Section 8 of the NESREA Act gives the agency a long list of powers in order to discharge creditably well its functions. The powers include the power to prohibit processes and use of equipment or technology that undermine environmental quality; conduct field follow-up of compliance with set standards and take procedures prescribed by law against any violator; and subject to the provisions of the Constitution of the Federal Republic of Nigeria, 1999, and in collaboration with relevant judicial authorities establish mobile courts to expeditiously dispense cases of violation of environmental regulations. Section 6(1)(a) of the NOSDRA Act provides that the agency shall be 'responsible for surveillance and ensure compliance with all existing environmental legislation and the detection of oil spills in the petroleum sector'. One air pollution issue in the petroleum sector that concerns the NOSDRA is gas flaring.

South Africa

Constitution of the Republic of South Africa, 1996, is the foundation for the air pollution control regime of the country. It provides for everyone in section 24 under the Bill of Rights (chapter 2, sections 7-39) the right to an environment that is not harmful to their health or well-being. The section provides also for the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that, prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.Other key air pollution control legal instruments include the following legislations.

i. National Environmental Management: Air Quality Act 39 of 2004

The Act aims, amongst other things, to protect the environment by providing reasonable measures for— (i) the protection and enhancement of the quality of air in the Republic; (ii) the prevention of air pollution and ecological degradation; and (iii) securing ecologically sustainable development while promoting justifiable economic and social development.[64]

ii. Carbon Tax Act 2019

This is an Act to provide for the imposition of a tax on the carbon dioxide (CO2) equivalent of greenhouse gas emissions and to provide for matters connected there with. It came into force on 1st June 2019. The Act taxes businesses that emit greenhouse gases and rewards those that use clean energy. The Act serves a twofold aim of enabling South Africa to meet its nationally-determined contribution commitments as are demanded by the 2015

[57]National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations, 1991, reg. 1.
[58]Ibid., reg. 2.
[59] Ibid.
[60] It was established by the National Oil Spill Detection and Response Agency (Establishment) Act, 2006, (No 15 of 2006).
[61]It was established by the National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007.
[62] It was established by the Federal Environmental Protection Agency (Establishment) Act, 1988.
[63]Ibid., ss. 7(c, d & h).
[64] National Environmental Management: Air Quality Act 39 OF 2004, s. 2(a).

Paris Agreement on Climate Change within the context of sustainable development.[65] It also enables South Africa to reduce its GHG emissions in line with the National Climate Change Response Policy and Development Plan.[66]

iii. Climate Change Bill 2018

The purpose of the Bill comes out in the long title as building an effective climate change response and ensuring the long-term, just transition to a resilient climate and a lower carbon economy and society. One of the objectives of this Bill is to provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance.[67] Another is to make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.[68]

Egypt

The main legislation regulating environmental protection is Law No. 4 of 1994. While it makes general provisions, necessary specific details are contained in the Executive Regulations of 18th February 1995 made pursuant to the dictates of Law No. 4 of 1994. These two legal instruments operate as the first comprehensive environmental law that supplemented and integrated preceding environment legislations.[69]Law 4/1994 creates in article 2 the Environmental Affairs Agency as the enforcement agency for environmental legislations. It operates as a public juridical personality affiliated to the Ministry for Environmental Affairs.[70] Part 2 of the Law No. 4 (articles 34-47) deals with the protection of the air environment from pollution. Among other things the law prohibits the useof machines, engines or vehicles whose exhaust emissions exceed the limits set by the Executive Regulations.[71] It prohibits also the spray or use of pesticides or any other chemical compound for agriculture, public health or other purpose except after observing the conditions, regulations and safety measures laid down in the Executive Regulations and in a manner that will not expose humans, animals, plants, waterways and other components of the environment, to the harmful effects of such pesticides or chemical compounds.[72]Part 2 (articles 34-49) of the Executive Regulations deals with the protection of the air environment from pollution. Article 35 of theExecutive Regulations requires Environmental Impact Assessment prior to the establishment of industries or businesses listed in Annex 2 of the Executive Regulations. The assessment is to be granted under the supervision of the Environmental Affairs Agency.

Ethiopia

The obligation of the Ethiopian government in protecting the air environment from pollution is anchored on the Constitution which makes the right to a healthy environment including the air environment a legally enforceable right. Article 44(1) of the Constitution of the Federal Republic of Ethiopia, which comes under Chapter three (Fundamental Rights and Freedom), states that 'All persons have the right to a clean and healthy environment' .Article 13(2) provides that the fundamental rights and freedoms specified in chapter three shall be interpreted in a manner conforming *inter alia* to international instruments adopted by Ethiopia. This opens the interpretation of the environmental rights provided in article 44(1) of the Constitution to embrace international agreements on air quality and pollution control adopted by Ethiopia. In other words every international instrument on air control adopted by Ethiopia is enforceable in Ethiopian Courts regardless of whether or not the instrument is domesticated.
Besides the Constitution, other legal instruments for the protection of the air environment include the following.

[65]J Cronje, T Head & C Gibson, 'Carbon tax finally coming to South Africa', (2018), http://thegreentimes.co.za/carbon-tax-finally-coming-to-south-africa/, accessed 17 June 2018.
[66] Ibid.
[67] S. 2(a).
[68] S. 2(c).
[69]'Pollution Control Policies in Egypt', July 2010, p. 5, available at: http://www.eeaa.gov.eg/portals/0/eeaaReports/EPAP/Proper/Industerial%20Policy/Industerial%20Pollution%20%20policy%20in%20Egypt%20English.pdf, 11 June 2018.
[70] Art. 2.
[71] Art 36.
[72] Art 38.

i. Proclamation No. 295/2002 A Proclamation Provided for the Establishment of Environmental Protection Organs

It re-established the Environmental Protection Authority as an autonomous public institution of the Federal Government.[73]The objective of the Authority is to formulate policies, strategies, laws and standards, which foster social and economic development in a manner that enhances the welfare of humans and the safety of the environment.[74] It is also to ensure the effective implementation of the policies and standards.[75]

ii. Proclamation No. 299/2002 Environmental Impact Assessment Proclamation

This Proclamation states that no person shall commence implementation of any project that requires environmental impact assessment without an authorization of the Environmental Protection Authority.[76]The Environmental Protection Authority is empowered pursuant to article 5 of the Proclamation to issue a directive with regard to projects requiring Environmental Impact Assessment.

iii. Proclamation No.300/2002 Environmental Pollution Control Proclamation

While generally prohibiting environmental pollution[77] this Proclamation particularly regulates Management of Hazardous Waste, Chemical and Radioactive Substance;[78] and Management of Municipal Waste.[79] On the environmental standard to be maintained in controlling, *inter alia*, air pollution, the Proclamation empowers the Environmental Protection Authority (the agency in charge of environmental protection in the country) to formulate practicable environmental standards based on scientific and environmental principles.[80] This it has to do in consultation with competent agencies.[81]

6. Conclusion and Recommendations

Efforts of African countries in ratifying key international legal instruments on air quality and pollution control such as the UNFCCC and the Vienna Convention for the Protection of the Ozone Layer is commendable. The ratification of these instruments manifests the desire of African States to cooperate with other members of the international community in improving the quality of the worldwide air environment and also in averting the adverse effects of air pollution on human beings and on the ecosystem on which humankind depends. This desire is further brought home in Africa in the regional multilateral legal instruments made by African States which touch on air quality and pollution control such as the African (Banjul) Charter on Human and Peoples' Rights (art.24) and the Bamako Convention. The commitment of leading economies in Africa, Nigeria, South Africa, Egypt and Ethiopia in putting in place municipal regimes for achieving within their territories the international obligations on air quality and pollution control is laudable. It sets the goal and part for weaker economies in Africa to follow. The proactive article 13(1) of the Ethiopian Constitution that automatically incorporates any international environmental protection instrument adopted by Ethiopia is very remarkable. It saves the instrument from the hurdles created by the requirement of domestication entrenched in some State Constitutions such as the 1999Nigerian Constitution. The Carbon Tax Bill of South Africa is another good initiative towards the reduction of the emission of greenhouse gases (GHGs).Having said this, African countries should go beyond ratifying international air quality and pollution control instruments, and create municipal legal and institutional regimes for air pollution control. They should show commitment in enforcing these legislations and seeing that the institutions created are enabled to discharge their statutory functions effectively. Economic development, which industrialisation is key to, should be understood to be unsustainable if it is not matched with adequate environmental protection. Air quality and pollution control is pivotal in environmental protection and sustainability. It would be counterproductive if industries are up and running everywhere, and people are dying everywhere as a result of the air pollution caused by the industries.

[73] Art. 3(1).
[74] Art. 5.
[75] Art. 5.
[76] Art. 3(1).
[77] Art. 3.
[78] Art. 4.
[79] Art. 5.
[80] Art. 6(1).
[81] Ibid.