

AIR POLLUTION, PUBLIC HEALTH AND ENVIRONMENTAL SUSTAINABILITY IN NIGERIA

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Abstract

This paper aims at highlighting the importance of proper air quality management. The natural and anthropogenic sources of indoor and outdoor air pollution, hazardous nature and ways to maintain sustainable environment, free from such pollution were conceptually discussed. Some important air pollutants and their associated morbidities were also highlighted. The health effects from exposure to passive smoking, gas flaring, biomass burning and vehicular emissions among others were highlighted, together with the efforts made internationally and nationally to ensure that toxic air pollutants are managed in an environmentally friendly manner. The paper concludes, by emphasizing the need to manage toxic air pollutants effectively, as this will allow informed decisions to be made about exposure to air pollutants, and thereby work towards preventing the risks posed to human health and the environment.

Keywords: Air Pollution, Passive Smoking, Environmental Sustainability, Public Health, Effects.

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Introduction

Air pollution is one of the major environmental health problems confronting Nigeria, yet information regarding this is very scanty. Air pollution and population health has become one of the most important environmental and public health issues (Bingheng & Haidong, 2008). Evidences from various governmental organizations and international bodies have proven that air pollution is a major risk to the environment, quality of life, and health of the population (Colbeck, Nasir & Ali, 2010). The World Health Organization-WHO states that 2.4 million people die each year from causes directly attributable to air pollution, with 1.5 million of these deaths attributable to indoor air pollution (Molles, 2005). Borenstein (2014) reported that emissions of carbon dioxide, the main heat-trapping gas from human activity, are increasing by 2.5 percent in 2014, and that scientists forecast that emissions will continue to increase, adding that the world in about 30 years will warm by about 2 degrees Fahrenheit (1.1 degrees Celsius). Economic development, urbanization, energy

consumption, transportation or motorization, and rapid population growth are major driving force of air pollution.

Air pollution is the introduction of chemicals, particulate matter or biological materials that can cause harm or discomfort to humans or other living organisms or cause damage to the natural environment or built environment (Tawari & Abowei, 2012). Air pollution occurs when gases, dust particles, fumes (or smoke) or odour are introduced into the atmosphere in a way that makes it harmful to humans, animals and plants. This is because the air becomes dirty or contaminated.

There are numerous challenges facing air quality studies in Nigeria, especially in Niger Delta Area. Like in most developing nations, the issues are multifaceted and the most acute have been lack of equipment, inadequate expertise, lack of infrastructure and weak policy framework (Tawari & Abowei, 2012). Since Nigeria started exploration of its oil and gas, and other natural

resources, it has experienced an escalation in its population growth, urbanization and industrialization together with great increase in motorization and energy use. As a result, a substantial rise has taken place in the type and number of emission sources of various pollutants. However, due to lack of air quality management capabilities, the country is suffering from deterioration of air quality.

The problem of air pollution became a fact to be reckoned with in Nigeria following the environmental side-effects of the rapid industrialization that accompanied the 1973 to 1980 oil booms in Nigeria (Nwachukwu & Ugwuanyi, 2010). Gas flaring, petroleum industry operation, traffic, massive use of fuel wood for cooking by the people due to the nation's ailing economy, indiscriminate bush burning, and other damaging forces have aspirated the problem of air pollution contemporarily. There is also a high rate of atmospheric pollution in Nigeria, especially in the country's industrial areas. For instance, the air over Lagos, where about 38% of the

manufacturing industries in the country are located, has since 1983 been credited with characteristic odour. The Niger Delta Area is indeed another case point.

In recent times, there has been international concern about the dangers posed to human health and the environment by air pollutants, and this has led to the development of international conventions, treaties, policies, and standard by developed and developing countries, to ensure that the hazards from air pollution are prevented and well managed in a sustainable manner. Interestingly, Nigeria is not left out in the pursuit for a cleaner environment, and has been a signatory to some of the international conventions on air quality management. Frantic efforts have been made to formulate standards and policies in this direction. This paper, therefore aims at highlighting the effects of air pollution on the environment, and how air pollutants can be managed for sustainable national environment.

Types of Air Pollution

The major sources of air pollution in the environment are indoor sources which include burning of biomass fuel such as wood, dung, crop residues, particulate matter, gases, domestic combustion of fossil fuel, soot, tar, and ash, environmental tobacco smoke (passive smoke or second hand smoke), cooking and heating appliances and vapours from building materials, paints, furniture, among others; and outdoor sources which include Greenhouse effect and Global warming, Ozone layer depletion, and Acid rain.

Indoor air pollution.

Indoor cooking and heating with biomass fuels (agricultural residues, dung, straw, wood) or coal produces high levels of indoor smoke that contains a variety of health-damaging pollutants. There is consistent evidence that exposure to indoor air pollution can lead to acute lower respiratory infections in children under age five, and chronic obstructive pulmonary disease and lung cancer in adults. Indoor air pollution is responsible for 2 million deaths

annually (WHO, 2005). Acute lower respiratory infections, in particular pneumonia, continue to be the biggest killer of young children, and this toll almost exclusively falls on children in developing countries. In many of the poorest areas of the developing world, one of the most insidious killers is indoor air pollution. Indoor air pollution – generated largely by inefficient and poorly ventilated stoves burning biomass fuels such as wood, crop waste and dung, or coal – is responsible for the deaths of an estimated 1.6 million people annually (WHO, 2005).

Outdoor air pollution.

Outdoor air pollution is large and increasing consequence of the inefficient combustion of fuels for transport, power generation and other human activities such as home heating and cooking. Combustion processes produce a complex mixture of pollutants that comprises of both primary emissions such as diesel soot particles and lead, and the products of atmospheric transformation such as ozone and sulphate particles. Urban outdoor air pollution is estimated to

cause 1.3 million deaths worldwide per year (WHO, 2005). Children are particularly at risk due to the immaturity of their respiratory organ systems.

Classification of Sources of Air Pollution

Sources of air pollution refer to the various locations, activities or factors which are responsible for the releasing of pollutants into the atmosphere. The sources can be classified into anthropogenic (human activity) sources and natural sources. The natural factors include volcanic eruption, forest fires, sea sprays, pollen dusts, harmattan dust, among others. The anthropogenic factors are domestic activities such as cooking stoves; municipal activities such as automobile emissions; agricultural activities such as pesticide fumes; industrial activities such as cement dust, among others.

Anthropogenic sources

Tawari and Abowei (2012) stated that anthropogenic factors of air pollution include stationary sources such as smoke stacks of power plants,

manufacturing facilities as well as waste incinerators and furnances; mobile sources such as motor vehicles, marine vessels, aircraft; chemicals, dust and controlled burn practice in agriculture and forestry management; fumes from paint, hair spray, varnish, aerosol sprays and solvents; waste depletion in landfills, which generate methane (a non-toxic highly flammable gas); military sources such as nuclear weapons, toxic gases, germ warfare and rocketry; biomass combustion in form of firewood, coal, bamboo trunks and dead leaves used as cooking fuel; bush burning; chemical fertilizer industries; pipeline explosion; gas flaring; and refuse burning in urban cities from domestic, municipal, agricultural and industrial sources.

Pollution due to traffic emissions constitute up to 90 to 95% of the ambient carbon monoxide levels, 80 to 90% of NO_x, hydrocarbon and particulate matter in developing countries (Tawari & Abowei, 2012). Particulate matter can also damage the lung capacity of individuals who are exposed during childhood and

adolescence, significantly decreasing their lung capacity (Gauderman, 2004). This situation is alarming, and is predicated on the poor economic disposition of developing countries. Poor vehicle maintenance culture and importation of old vehicles, which culminates in an automobile fleet dominated by a class of vehicles known as 'super emitters' with high emission of harmful pollutants has raised high figure of emission concentration (Ibrahim, 2009).

In Nigeria as well as in other developing countries, which are not yet fully industrialized, majority of the air pollution problems result from automobile exhaust. The air along traffic corridors where majority of residents in the formal and informal sectors subsist daily to conduct their activities could hardly be regarded as fresh. This is due to automobile emissions from various activities on the roads. Much attention is given to general industrial pollution and pollution in oil industries, with little reference to pollution caused by mobile transportation source of air pollution. Pollution from mobile

transportation is on the rise due to increase in per capita vehicle ownership, thus resulting in high congestion on Nigeria city roads, and increase in the concentration of pollutants in the air, consequently increased health risks for human population.

Automobile exhaust constitutes 75 to 80% of gross air pollution in Nigeria, the remainder coming from dust arising from un-tarred roads, smoke and gases from industries, bush burning and burning of refuse (Ezeka, 2004). Organic Lead (Pb) compounds Tetra-ethyl Lead (TEL) are added to fuel to increase its octane number. Lead added to the Nigeria's super grade fuel is in the range of 210 – 520mg/l, and about 80% of Pb in fuel escapes through the exhaust pipes as particulate, while 15 to 30% of this amount is air-borne.

Natural sources

Natural pollution occurs when contaminants drawn from animal, plant or land sources get disseminated in the atmosphere in the normal course. It also results from forest fires,

volcanic eruptions, dust storms and sand storms. Natural contaminants include spores, pollens, moulds, fur, feather, hair, among others. Natural sources of air pollution include dust from natural sources, usually large areas of land with little or no vegetation; Radon gas from radioactive decay within the earth's crust; methane emitted by the digestion of food by animals such as cattle; smoke and carbon monoxide (CO) from wildfires; volcanic activity, which produce sulphur, chlorine and ash particulates, and volcanic organic compounds – VOCs (Tawari & Abowei, 2012).

Air Pollutants and Associated Diseases

A substance in the air that make the air unclean which can cause harm to humans and the environment is known as air pollutant. Pollutants can be in form of solid particles, liquid droplets or gases, and may be natural or man-made (Anderson, 2005). Prevalent air pollution-related morbidities include breathing difficulties, bronchitis and aggravation of asthma, cardio-respiratory disorders, pulmonary oedema, eye disorders and skin

disorders (Baird, 2010). Pollutants of major public health concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide. Hydrogen sulphide (H₂S) and sulphur dioxide are regarded as the most damaging and irritating of all contaminants in polluted air.

There are two types of pollutants: primary and secondary pollutants. Primary pollutants which are those gases or particles that are pumped into the air to make it unclean and include CO from automobile (cars) exhausts and sulphur dioxide from the combustion of coal. Secondary pollutants which are pollutants in the air mix up in a chemical reaction; form an even more dangerous chemical. Photochemical smog is an example of this, and is a secondary pollutant. Particulate pollutants include dust, soot, fumes, mist, smoke, fog among others. The following are some of the air pollutants and their associated diseases (WHO, 2004):

Respiratory: irritation and decreased pulmonary function.

Particulate Matter: stress on the heart, bronchial constriction,

impairment of Lung elasticity and gaseous exchange efficiency, silicosis (inhalation of dust particles), respiratory tract disease systematic toxicity, and altered immunity.

Cement Dust: pulmonary tuberculosis, allergic asthma, pneumonia, heart disease, bronchitis influenza emphysema and mycosis.

Carbon dioxide: it is emitted from combustion, cements production and respiration, and reduces the quantity of O₂ transported to tissues, hence can impress extra burden on those suffering from anaemia, heart, respiratory tract infections among others.

Lead/Asbestos: causes asbestosis (chronic Lung cancer), and mesothelioma (a rare form of cancer), kidney diseases and neurological impairment, which primarily affects children.

Photochemical oxidants (e.g., ozone): formed from NO_x and VOCs. It is smog. Long exposure can cause reduced eye-sight, fatigue, pneumonia, and respiratory infections.

Sulphur dioxide: it is produced by volcanoes in various industrial processes, and causes respiratory

irritation, shortness of breath, impaired pulmonary function among others.

Carbon monoxide: it is produced by incomplete combustion of fuel such as natural gas, coal (charcoal burning) or wood as well as vehicular exhaust, and interferes with O₂ uptake into the blood (chronic anoxia), heart and brain damage among others.

Nitrogen oxide: it is emitted from high temperature combustion, and causes reduction in lung function, increase in mortality, increase in airway allergic inflammatory reaction, and increased probability of respiratory symptoms.

Effects of Air Pollution

Air pollution has effects mainly on the environment and health. Environmental effects include global warming, ozone layer depletion, acid rain, climate changes, poor visibility, corrosion of artifacts and other materials. Health effects include ocular effects such as lacrymation, cataract, cancer; dermal effects such as erythema, dermatitis, cancer; and pulmonary effects such as Upper Respiratory Tract Infection (URTI), Lung disorders, cancer among

others. World Health Organization (2005) stated that air pollution causes low birth weight, cancers, acute respiratory infections, and that poverty (lack of resources) restricts options to obtain and use cleaner fuels and improved housing. The human health effects due to air pollutants include carcinogenicity, Pulmonary tuberculosis, Cerebrospinal meningitis, pneumonia, whooping cough, and measles (Nwachukwu & Ugwuanyi, 2010). Lead poisons present in the body systems, is particularly dangerous to children developing brain and nervous system; and also destroys plant and animal life, reduction of visibility in towns. Its effects also include corrosion of metals, artifacts, destruction of buildings, and soiling and damaging of clothing. Similarly, with increasing age, people become more vulnerable to the harmful effects of environmental air pollutants due to the deterioration of their physiological and biochemical processes.

For example, cigarette smoking is known to cause predisposition to the development of lung and bronchus

cancer. Exposure to involuntary or passive smoking otherwise called secondhand smoke, thirdhand smoke or environmental tobacco smoke is more harmful. Passive smoking is the inhalation of tobacco products such as cigarettes, cigar and other tobacco products used by others. It occurs when tobacco smoke permeates any environment, causing its inhalation by people within that environment. Scientific evidence shows that exposure to secondhand smoke causes diseases, disability and death (Winickoff, Friebely, Tanski, Sherrod, Matt, & Hovell, 2009). This passive smoking can be more dangerous than active smoking. Apart from the annoying discomfort of coughs, headaches, nasal discomfort, irritation of the eyes and breathlessness, it can give rise to many diseases as direct smoking. Non-smokers who breathe in second hand smoke take in nicotine and toxic chemicals by the same route smokers do. People can be exposed to secondhand smoke in the homes, cars, the workplace and public places such as restaurants, shopping centres, public transportation, schools and day care centres and recreational settings.

There is no safe level of exposure to passive smoking, non-smokers receive equal amount and even greater of what smokers exhaled. Even low levels of secondhand smoke can be harmful. The only way to fully protect non-smokers from secondhand smoke is to completely eliminate smoking in indoor spaces or buildings such as restaurants, bars, cars, rooms among others.

Third hand smoke is a new term for tobacco toxins that remain and persist after a period of active smoking. These chemicals are deposited on surfaces such as tables, furniture, and floors as well as in dust. Thirdhand smoke also vulcanizes and contaminates air for days, weeks, and even months after the smoking has ceased. Its effects include upper and lower respiratory infections, otitis media with effusion, sudden infant death syndrome, exacerbation of asthma, bronchitis, pneumonia, impaired growth and development among others (Winickoff et al, 2009).

Even brief exposure to passive smoking has immediate adverse

effects on the cardiovascular system and increases risk for heart disease and lung cancer. Secondhand smoke is associated with disease and premature death in non-smoking adults and children. Overtime, it can damage cells in ways that set the cancer process in motion. Chemicals in tobacco smoke damage sperm which might reduce fertility and harm foetal development. Exposure to passive smoking while pregnant increases the chance that a woman will have a spontaneous abortion, still born birth, low birth-weight baby (less than 2,500 grams or 5.5 pounds-premature birth or small for gestational age) and other pregnancy and delivery problems. Babies and children exposed to secondhand smoke are at an increased risk of sudden infant death syndrome (SIDS), acute respiratory infections (such as pneumonia, bronchitis), ear infections (middle), arterosclerosis, cough ,sneezing, breathlessness, lymphoma, brain tumours and more severe and frequent asthma attacks (US Environmental Protection Agency-EPA, 2012). It also causes bad breathe on non-smokers, unpleasant smelling of smokers, and fire outbreak may

result due to carelessness in disposing cigarette stubs. Equally, the throats and eyes of non-smokers are often irritated and involuntarily, they inhale CO due to the tobacco fumes. For example, CO and NO_x, when inhaled, combine with haemoglobin of the blood forming carboxyhaemoglobin and methemoglobin respectively, leading to almost complete oxygen starvation and sure death (Ezeka, 2004).

Public Health and Environmental Impact of Air Pollution

Many of the toxic air pollutants have adverse effects on humans and aquatic organisms (e.g., Global warming and effects). Solid fuel dependency exacerbates deforestation, a process that contributes to the build-up of greenhouse gases (GHGs), particularly carbon CO₂, in the earth's atmosphere, and thus to global climate change. Major GHGs: CO₂, Chlorofluorocarbons (CFCs), methane, nitrous oxides and ozone are primarily from the burning of fossil fuels (coal, oil, natural gas) and land use practices, such as ploughing, among others. The greenhouse effect

is essential for our survival on earth, since it produces the extra warmth, which prevents the surface temperature of the planet earth from going below freezing point, but maintains the tropospheric temperature of about 15°C. Deforestation can generate soil erosion, pollution of streams with sediment and debris, loss of biodiversity, and changed patterns of vector-borne disease transmission – all of which impact health (WHO, 2002).

The operations of the industries dealing with oil mineral reserves especially the upstream and downstream petroleum sectors as well as a variety of other anthropogenically-related activities including biomass combustion, refuse burning and traffic emissions release a barrage of substances such as volatile organics; oxides of carbon, nitrogen, sulphur; particulate matter; heavy metals; and other toxics at levels that most times exceed both the national and international guidelines. Apart from compromising the quality of the atmosphere, most of the air pollution in Nigeria is observed to have local and

regional effects such as the formation of acid rain, water and soil pollution, and impacts on plants and wildlife, effects on materials and artifacts, and recently contributing to the global warming effects. The urban environments of Nigeria are characterized with increased particulate matter. Most people are constantly exposed to hazard of particulate matter. Efe (2008) revealed that residents of refinery road, commercial areas, traffic-clogged areas, and high-density residential areas in Warri were affected by exposure to particulate matter. Industrial emissions from NDA, Lagos, and Kano add to the burden of gaseous and particulate pollutants in the air (Tawari & Abowei, 2012; Okonula, Uzairu, Gimba, & Ndukwe, 2012).

Gas flaring is one of the hottest environmental issues in Nigeria. Flaring is the controlled burning of the waste natural gas associated with oil production. The flares (gas flaring) raise the temperature of the surrounding environment to temperatures beyond normal of 13 –

14,000 degrees celsius. One of the main sources is the 'solution gas' trapped in underground oil supplies, which is released when oil is brought to the surface. In recent years however, the expansion of oil drilling has resulted in more flaring, triggering public health reactions ranging from annoyance to allegation of serious health consequences for animals and humans (Tawari & Abowei, 2012). Flaring sometimes results in an unpleasant 'rotten egg smell'. Nigeria flares more gas associated with oil extraction than any other country with estimates suggesting that of the 3.5 billion cubic feet (100,000,000m³) of Associated Gas (AG) produced annually, 2.5 billion cubic feet (70,000,000m³) or about 70% is wasted via flaring. Nigeria holds the highest record (19.79%) of natural gas flaring globally and is responsible for about 46% of Africa's total gas flared per ton of oil produced, and there are not less than 123 flaring sites in the region, making Nigeria one of the highest emitter of green gases in Africa (Uyigüe & Agho, 2007). Gas flaring is generally discouraged as it releases toxic components into the

atmosphere; and contributes to climate change, which is a continuous rapid and prolonged alteration of climate in one direction that manifests in diverse ways. Apart from the release of acid rain, smog, and greenhouse gases, enormous heat is emitted. The soils near flares are not fertile, affecting agricultural yield.

Automobiles and diesel-fired electricity generators contribute to the choking air in the city which is plagued by daily smog that covers the skyline of the central cities in Nigeria. Studies carried out by the Federal Environmental Protection Agency-FEPA (1991) show a moderate-to-high concentration of pollutants such as oxides of carbon, sulphur, nitrogen; organic acids, particulate matter and hydrocarbon in the atmosphere in Nigeria, especially the NDA. The majority of these come from automotive engines and industries. Osuji and Avwiri (2005) monitored the ambient air quality of industrial areas of Nigeria for criteria pollutants: oxides of carbon, nitrogen and sulphur; ozone; particulate matter and lead, and found all of them to be very high as

compared to WHO air quality guideline. There has been no concerned and effective effort on the part of the government, let alone the oil operators to control environmental problems associated with the oil and gas industry (Baird, 2010).

Environmental Sustainability in Nigeria

The concept of environmental sustainability is based on the premise that people and their communities are made up of social, economic, and environmental systems that are in constant interaction and must be kept in harmony or balance if the community is to continue to function to the benefit of its inhabitants, now and in the future. Environmental sustainability arose out of the growing recognition that human activities are affecting many of the earth's critical resources, not only locally but also at a global scale, and with potential effects on humans as well as ecological health. It is therefore improving the quality of human life while living within the carrying capacity of supporting ecosystems.

The environment could be adequately sustained through incorporating disaster resilience and mitigation into decisions and actions, encouraging afforestation and reforestation, proper waste management and nuclear disposal, use of products of technology to avert the problem of oil spillage, ensuring the availability of clean air and water for today and tomorrow among others.

Air quality in Nigeria and particularly the NDA is still in its infant stage and encumbered with several challenges. The Nigerian government is not involved in systematic and consistent air quality assessment programmes as is being done in other parts of the world such as that carried out by the Environmental Protection Agency (EPA) in the US. There is the problem of insecurity and difficulty in terrain that militates against most community based air sampling initiatives, and then the lack of requisite and adequate manpower to carry out multifaceted and complex air quality studies in the country. There is the lack of collaboration between key regulatory authorities, laxity in the enforcement

of emission regulations and unavailability air pollution and Green house Gas (GHG) monitoring stations in the country (Baird, 2010). Air quality management can better be done through environmental education, legislation, enforcement, monitoring, in-situ containment devices such as dust precipitators, wet scrubbers, cyclones among others. Most people agree that to curb global warming, a variety of measures need to be taken. On a personal level, driving and flying less, recycling, and conservation reduces a person's "carbon footprint"—the amount of CO₂ a person is responsible for putting into the atmosphere. On a larger scale, governments are taking measures to limit emissions of carbon dioxide and other greenhouse gases. One way is through the Kyoto Protocol, an agreement between countries that they will cut back on CO₂ emissions. Another method is to put taxes on carbon emissions or higher taxes on gasoline, so that people and companies will have greater incentives to conserve energy and pollute less. (Essick, 2014).

Strategies to reduce health and environment impacts include shifting from solid fuels to cleaner energy technologies. For instance, liquid petroleum gas (lpg), biogas or solar power generation – can potentially yield the largest reduction in indoor air pollution levels, while minimizing environmental impacts of energy production and consumption in general; improved design of stoves and ventilation systems can reduce indoor air pollution in many poor communities, where fuel distribution networks remain limited or alternative technologies are unavailable.; and public awareness of the health risks of indoor air pollution is also an important factor in change. Nigeria has put in place an array of regulations adequate to control air pollution, and improve air quality. The principal regulatory agencies with the mandate for air quality management are the Federal Ministry of Environment, Department of Petroleum resources (DPR), Non-Governmental Organizations (NGOs), and the academia (Ezeka, 2004).

Recommendations

- § Industries should be sited far away from residential areas as well as creating conditions for complete combustion of fuel in internal combustion engines.
- § Chemical wastes should be discharged into the air through fumes chamber.
- § Companies that incinerate waste; refineries; biomass, glass, cement, ore, steel plant, and fertilizer industries should use a specialized and specific air pollution control equipment to deal with acid-gas emissions.
- § Companies using power generators or industrial processing can use Electrostatic Precipitators (ESP); companies dealing with particle emission can use Fabric Filter (FF); Flue gas Treatment (FGT) and Flue Gas Desulphurization (FGD) can be used effectively in incineration industry (Nwachukwu, Chukwuocha, & Igbudu, 2012).
- § Air quality can be improved by developing monitoring

mechanisms, regulations and enforcement measures; and instituting planning policies to minimize pollution that may be caused by future development.

§ There should be a focus on the reduction of pollution levels from vehicles, industry, gas flaring and domestic burning of timber, creation of smokeless zones, to permissible levels as defined in national and international standards.

§ Existing air quality monitoring programmes should be re-examined and new ones introduced to determine the most effective means of mainstreaming national programme with regional projects to improve air quality.

§ Motor vehicles annual testing and other regulations must be created or re-introduced and strictly enforced.

§ There should be engagement in renewable energy, clean energy and cleaner air initiatives; and usage of emissions abatement control mechanisms by polluters should be enforced.

§ There should be suitable legislation covering powers to local authorities to carryout investigations, research and education concerning air pollution.

Conclusion

This paper has shown that air pollution is the introduction of chemicals, particulate matter or biological materials that can cause harm or discomfort to humans or other living organisms or cause damage to the natural environment or built environment. Increasing state of air pollution has been detected in every compartment of the ecosystem. The dangers from air pollutants are incalculable. It is not only human health that is at risk, but also the environment. Unfortunately, few people are aware of this reality. Indoor (burning of biomass fuel) and outdoor (greenhouse effect, ozone layer depletion, acid rain) air pollution are the major types of air pollution. Air pollution is usually caused by anthropogenic (human) factors such as domestic activities, automobile and industrial emissions, and natural

factors such as volcanic eruption, forest fires, dusts among others. Human and environmental effects of air pollution include global warming, ozone layer depletion, climate changes, poor visibility, dermatitis, low birth weight, cancers, and acute respiratory infections, coming from exposure from passive smoking, among others.

There is an urgent need to stop the alarming trend towards poisoning humanity and the planet itself, especially effects from exposure to passive smoking, gas flaring, vehicular emissions, particulate matter, and other toxic air pollutants. The citizenry, especially of developing countries, must take the important step of becoming part of the solution. It is heart-warming to note that Nigeria has identified with the other countries of the world in this noble pursuit. To further demonstrate a collective resolve to controlling air pollution, Nigeria has taken bold step as education, awareness, intersectoral, and international collaborations. With these strategies in place, Nigeria will not only be in a position to protect her

citizenry from physical hazards which air pollution is inclusive, but will also be able to preserve the environment for generations yet unborn.

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