Knowledge of Environmental Laws and Extent of Compliance to the Practice of Green Chemistry among Industrialists in Southern Nigeria

Ese Monica ALAKE,
Department of Integrated Science, College of Education, Ikere-Ekiti.

Abstract

Human activities such as industrial development, fossil fuel burning, agricultural practices account for changes in the environment, hence Nigeria has regulations, laws and policies with fine and penalties to enhance benign practices involving creation and diversification of chemical reactions that gives new products and processes that are sustainable, reducing waste or harmful matter in the environment. Based on this background, the study investigated the knowledge of environmental laws and extent of compliance to the practice of green chemistry principles among industrialists in Southern Nigeria. The study was quantitatively designed to investigate three industrial states comprised Rivers, Delta and Lagos States. Purposively, one hundred and three industrialists were selected due to accessibility problem. A validated Industrialists' Questionnaire (IQ) consisting of two sections having 25 items on environmental laws and expected green chemistry practice was used to elicit information. Data collected were analyzed using t-test and ANOVA. Among others, the findings showed that, industrialists having knowledge of environmental laws had better practice of green chemistry principles than their counterparts who do not have (t-cal 6.62 =P<0.05), while industrialists' qualification had no significant difference on their practice of green chemistry principles (F-cal 0.62 = p>0.60).Thus, publicity on environmental laws and benign practices should be given strong attention among industrialists.

Keywords: Industrialists, Laws, Practice, Chemistry.

Introduction

Environmental laws in Nigeria has been promulgated to twenty-four environmental regulations guiding the protection of the environment, usually made public to all stakeholders with no exception to industrialists. All organisms including man modify their environment which has resulted in increase in population, consumption of food and production of non-benign materials. The composition of the earth's atmosphere is

consistently undergoing an unprecedented change, largely as a result of human activities, industrial development, fossil fuel burning, deforestation and agricultural practices. These have led to an increase in the atmospheric concentration of pollutant gases from industries. Such gases include carbon (iv) oxide ($CO_{2)}$ and methane which are gases responsible for the green-house effect as opined by Ebi, Mearns and Nyezi (2003). The increase in concentration of these gases have far reaching consequences on man and the environment especially in gas flare area as confirmed by the findings of Amanze-Nwachukwu,(2008) which stated that, 400 million tons of CO_2 is released yearly through gas flaring.While Ugwuaren (2008) was of the view that, more than 70% of the oil fields in Nigeria flare about 0.84 trillion cubic feet of associated natural gas every year. Most oil communities therefore live with gasstacks that flare gas 24 hours a day at temperature of 13-14,000°C of unburned carbon from industries, automobiles, generators and other engines that use fossil fuel products (Ugwaren, 2008). Over 50 million tons of CO_2 and 12 million tons of methane are emitted in Nigeria more than the rest of the world (Bassey, 2001). Worst still, is the recent daily blast of oil pipelines through vandalization by the Niger Delta Avengers.

Despite the fact that Environmental governance commenced in Nigeria in 1988 by the establishment of the Federal Environmental Protection Agency (FEPA), there seems to be no adherence to the laws, nor punishment for violators of the environmental laws. Nweke (2017) was of the view that environmental pollution may continue to torment Nigerians for years to come if drastic measures are not taken to checkmate flaring of gasses, reckless dumping of refuse and building on water ways. Some among the rich have decided to make use of waterways as fallow grounds to build their properties. This attitude has become the norm among the rich who believe government laws are not made for everybody. Thus, this carefree attitude towards the environment may be exhibited by all categories of Nigerians if not checked.

Green chemistry or sustainable chemistry involves creation on the molecular level: devising chemical reactions that give rise to new products and processes that have the ability to meet sustainability goals, such as becoming more energy-efficient and reducing the amount of harmful matters found in the environment. Some major themes in green chemistry today include; reducing our reliance on non-renewable energy sources, reducing industrial carbon footprints, breaking down landfill waste and taking

advantage of abundant resources that nobody wants. An example is Carbon (iv) oxide (CO_2) that has a deserved reputation of being a damaging greenhouse gas that pushes up the rate of global warming. Green chemistry has been pivotal in coming up with ways to use CO_2 as a resource instead of having it become a harmful product stuck in our air. For instance, chemists have found out that when CO_2 molecules are kept in a transitive state, it is then used as an industrial refrigerant to keep things cool. This application makes CO_2 useful instead of being harmful to man. The inability of industrialists to show concern towards the environment has become worrisome and of concern to researchers, hence the need to determine the level of knowledge of environmental laws by industrial workers, since, a standard knowledge of environmental laws will enhance practice of green chemistry principles in order to have a healthy environment for the safety of all.

The Federal Government of Nigeria has promulgated various laws and regulations to safeguard the Nigerian environment, including the Federal Environmental Protection Agency Act of 1988 (FEPA Act). The following regulations were made pursuant to the FEPA Act; National Environmental Protection (Effluent Limitation) Regulations; National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Wastes) Regulations; the National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations and the Environmental Impact Assessment Act of 1992 (EIA Act). These regulations, laws and policies are in relation to environmental research and technology both at the Federal, State and Local Government levels, as highlighted in the law No 14, Bill No 14 called 'The Agency'. The Nigeria EPA spelt out some duties as highlighted by Bassey (2001) and Ajakadike (2001) as follows:

- ✓ encouraging a productive and enjoyable harmony between man and his environment
- ✓ promoting efforts which will prevent or eliminate damage to the environment and biosphere
- ✓ and stimulate the health and welfare of the people in general, among others.

The bill equally empowers the agency to consider the use and value of public water supplies, air quality, such as prevention and control of atmospheric pollution, ozone protection by making recommendations and programmes for the control of any substance, practice, process or activity which may reasonably be

anticipated to endanger public health or welfare.

The Agency is to identify major noise control technology and make recommendations to control noise originating from industrial, commercial, domestic, sports recreational, transportation and other similar activities. The Agency is also saddled and empowered to convict any person or groups of persons who violate the provisions of subsection (1) of section 22 of the Environmental Protection Agency law through discharge of hazardous substance and related offences Anderegg (2010). The conviction ranges from a fine of one hundred and fifty thousand naira (#150,000) if committed against water, one hundred and twenty-five thousand naira (#125,000) if committed against the land and one hundred thousand naira (#100,000) if committed against the air space, to a term of imprisonment up to ten years. Surprisingly,95% of industrial discharges collected in Southern Nigeria go to landfills, which indicates heavy reliance on landfills resulting in huge amounts of industrial trash, scrap metals, out-door litter, medical and solid wastes in the environment (Ugwuaren, 2008). The Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2002, published by the Directorate of Petroleum Resources (DPR) provides that DPR, shall issue permits for all aspects of oil-related effluent discharges from point sources (gaseous, liquid and solid) and oil-related project development. The EGASPIN also provides that environmental permits shall be issued for existing and new sources of effluent emission. All projects in the oil and gas industry must be issued with the requisite environmental permits and failure to procure same may lead to penalties. Environmental degradation has continued to generate unpleasant challenges for health and economic development in Nigeria. Some of these Problems include deforestation, pollution, global warming and improper use of pesticides. Despite the fact that there are environmental laws and policies targeted at ameliorating these problems, the situation in Southern Nigeria seems to be degenerating owing to the fact that these laws are not effectively enforced (Oyebide, 2018).

Thus, the general objective of the study investigated the knowledge of environmental laws and extent of compliance to the practice of green chemistry principles among industrialists in Southern Nigeria. Specifically, first, the study determined if practice of green chemistry principles among industrialists' having knowledge of environmental protection laws differ from those who do not have. Second, the study investigated if

the qualifications of the industrialists make difference between and within groups of those in practice of green chemistry principles.

Research Questions

1. Is there any difference between those having knowledge of environmental protection laws among industrialists' practice of green chemistry principles and those who do not have?
2. Is there any difference in the practice of green chemistry principles among industrialists having University qualifications and their counterparts who have lower educational qualifications?

Research Hypotheses

Based on the above, two null hypotheses were formulated

1: There is no significant difference in the practice of green chemistry principles among industrialists having knowledge of environmental protection laws and their counterpart who do not have.

2: There is no significant difference in the practice of green chemistry principles among industrialists with University degree(s) and their counterparts who have lower education qualifications

Methodology

The study is a descriptive research design of survey type. The staff of industries (managerial, senior and junior staff) in oil and gas sector, food supply, energy and chemical industries in Southern Nigeria constituted the population for the study. Three Industrialized States consisting of seven (7) industries were used as case study. The industrialized states include Rivers, Delta and Lagos States. Originally a total of three hundred and eighty-four (384) industrialists which followed Krejcie and Morgan (1970) sample determination table comprised of managerial staff, senior staff and junior staff across the three states. These were those that returned instruments due to unavailability of population list, purposive sampling technique was used to reach only 103 staff of industries made up of 03 managerial staff, 50 senior staff and 50 junior staff. An Industrialists' Questionnaire (IQ) designed by the researcher consisted of two sections having 25 items relevant to the expected green chemistry practice principles of industrialists was used to elicit information from the industrialists. Using Cronbach Alpha, the 1Q instrument was tested for reliability with an estimated coefficient of reliability of0.73. Using the available data, t-test and analysis of variance (ANOVA) were used to estimate the data. The t-test was selected because the standard

deviation was not initially known and normal distribution was not required Jason and Thomas (2012)

Results

The results regarding the hypotheses earlier stated are presented in this section.

Hypothesis 1.There is no significant difference in the practice of green chemistry principles among industrialists having knowledge of environmental laws and those who do not have.

Table 1: t-test Analysis on Industrialists and Knowledge of Environmental Laws

Categories	N	Mean	SD	df	t-cal	P
Industrialists KOEL	60	81.62	5.57	101	6.66	.001*
Industrialists NKOEL	43	66.93	15.78			

Note: *Significant at P<0.05.

Table 1 showed that the t-calculated 6.66 = P< 0.05 is significant. This implies that the null hypothesis was rejected because industrialists who had knowledge of environmental protection laws (mean 81.62, SD 5.57, df 101 = 6.66 = P< 0.05) have better practice in green chemistry principles than their counterparts who do not have knowledge of environmental laws.

Hypothesis 2: There is no significant difference in the practice of green chemistry principles among industrialists with University degree(s) and their counterparts who have lower education qualification.

Table 2: One-way ANOVA of Industrialists' Qualifications and Practice of Green Chemistry

Categories	SS	Df	MS	F-cal	P
Between Groups	327.976	3	109.330	.620	.600 NS
Within Groups	17361.753	99	175.370		
Total	17689.728	102			

The table 2 showed that F-cal 0.62 = P> 0.6 is not significant at 0.05 level of significant. This implies that the null hypothesis is upheld, that is, no significant difference existed in the practice of green chemistry principles among industrialists with University degree(s) and their counterparts who had HND, OND/NCE and Secondary School Certificates.

Discussion

The findings also showed that industrialists having knowledge of environmental laws exhibited better practice of green chemistry principles than their counterparts who do not have. Surprisingly, the bulk of the respondents opined that, lack of enforcement of environmental laws by government accounted for their low practice of green chemistry principles. Oyebide (2018) also stated that non enforcement of environmental laws was the salient reason for lack of concern for environmental support in Nigeria.The industrialists are more concerned with the expensive nature of recycling and conversion of used materials that are not benign. Furthermore, researches of Ndoke, Akpan and Kato (2006) and Musa, Ifatimehin and Tajani (2012) revealed that unburned carbon has eco-toxic effects such as endocrine disruption resulting in the disruption of the world ecosystems which may be terrifying. The low knowledge of environmental laws by industrialists could lead to low production of benign materials and chemicals. Whereas, developed countries like United State of America have production of benign products and recycling of used materials are encouraged.

Findings of this study have far reaching implications for industrialists and government at all levels in Nigeria since industrialists have little or no knowledge of environmental laws. Government at local, state and federal levels do not monitor nor enforce environmental laws hence, there is no support for the environment in Nigeria as observed by Oyebide (2018). This is in line with the findings of Nweke (2017) and Nwafor (2006), opined that the development and proper application of legal instruments in the field of environment is essential for the achievement of an environmentally sound and sustainable development. There is the need to ensure that Nigerians live in an environment free from pollutants, health hazard and activities that could further cause degradation of the physical and biological environments of the nation. To meet the above challenge requires coordinated actions by national agencies, government at all levels, industrialists' compliance to environmental laws through periodical seminars and conferences with a strong focus on environmental consciousness and practice of green chemistry principles.

Conclusion and Recommendation

The study investigated environmental protection practices among the industrialists and observed that there

was low practice in Southern Nigeria. It is therefore imperative that development of partners, both public and private, who support the country's own policies and help build individuals and industrialists are encouraged. This will further give capacity to conduct and monitor the activities that supports our environment. Publicity on environmental support should be made within the industrial arena alongside the economic benefits of new greener technology, so as to enhance benign material usage, synthesis and products by industrialists. There should be an increase in national board inspections of oil and gas pipelines as done in other countries. Pipeline safety should be encouraged by employers and industrialists should be directed to obtain higher certificates and degrees that are relevant to their jobs.

New ways should be devised for extracting carbon (iv) oxide and other pollutants generated in burning coal, oil, wood and reducing the emission of particulates that damages the respiratory system. Development of social awareness and public policies that enhance benign processes and products by the use of slogans such as keep Nigeria clean and safe. Federal, state and local governments should organize conferences, seminars, workshops on environmental laws for industrialists. There should be development of new bio-fuels which reduces the net difference between current absorption and emission of greenhouse gasses. The production and use of solar and waste energy should be encouraged from secondary school level. Environmental laws and their implications should be made known to the public by using bill boards, adverts, radio and television programmes in both national and local stations. Government through these policies should encourage all citizens to behave in ways that leaves the Nigeria environment cleaner and healthy for man.

References

Ajakadike, J.C. (2001). Urban Solid Wastes: Problems and Management in Nigeria, In OfomataG.E.K and Phil- Eze P. O. In Geographical Perspectives on Environmental Problems and Management in Nigeria. Enugu. 164- 181.

Amanze-Nwachukwu, C. (2008). Nigeria, Norway seal deal on gas flaring, oil spill. Retrieved from http://wwwv.thisdayonline.com/nview.php?id+99813 January 9. 2019.

Anderegg, W.R.L. (2010). Expert erodibility in climate change" Proceedings of The National Academy of Sciences 107 (27), DOI:10:1073/pnas. 1003187107

Bassey, N. (2001). Oil and gas in Africa: Ecological debt huge as the sky: Paper presented during the Globalization' Ecological Debt, climate change and sustainability: A South- South Conference' held in Benin in November 21, organized by Action Ecological from Ecuador,

Friends of the Earth, Benin and Friends of the Earth International. Retrieved fromhttp//wwwdebtwatch.org/documents/enprofunditat/Deuteecologic/oilandgas.doc 99-102.

Ebi, K. L, Mearns L. O & Nyezi, B (2003). Weather and climate: Changing human Exposures. In McMichael A.J, Campbell-Lendrum D.H, Ebi K.L, Githeko A.K, Scheraga J.D &Woodward A (Eds.), Climate Change and human health risks and responses. Geneva, World health organization.

Jason M. E & Thomas E. J (2012) BMJ quality and safety 21 (6), 490-498

Krejcie, R.V & Morgan, D.W (1970). Determining sample size for research activities. Educational and Psychological Measurement.

Musa, S.D, Ifatimehin, O.O & Tajani, S.T (2012). An assessment of effects of automobile emitted carbon dioxide on urban surface air temperature in Anyigba,Nigeria. *Nigeria Geographical Journal* 8(1) 1358-4319.

Ndoke, P.N, Akpan U.G & Kato M. E (2006) Contribution of vehicular traffic to carbon dioxide emission in Kaduna and Abuja, Northern Nigeria. *Leonardo Electronic Journal of Practices and Technologies* 5 (9), 81-90.

Nweke M. (2017). Effects of environmental laws on business. The Sun Retrieved 6" September,2020. https://www.sunnewsonline.com/effects-of-nigerian.

Oyebide, O.J (2018). Impact of Environmental Laws and Regulations on NigerianEnvironment.*World Journal of Research and Review* (WJRR) ISSN: 2455-3956,7(3), 9-14

Ugwuaren, I. (2008). Groups petition National Assembly on 2008 gas flaring Deadline Lagos: Leadership, January 21.