Siting of Petrol Stations and Compliance to Environmental Regulations in Jalingo Metropolis, Taraba State Nigeria

Abstract

Environmental regulation is a complex interdisciplinary effort involving ethical principles, political interests, scientific knowledge, and technological capacities, that covers environmental media and protection and conservation of wildlife, fulfilling environmental legislation requirement. Compliance is a substantial element of environmental regulation. This study appraised the siting of petrol stations and compliance to environmental regulations in Jalingo metropolis. Specifically, it assessed the extent of compliance in the siting of petrol stations in Jalingo metropolis and compared the compliance level of the three categories of petrol stations- Nigeria National Petroleum Corporation (NNPC), major oil marketers and the independent oil marketers. The study adopted the survey research design. Data was obtained from twenty (20) petrol stations, two hundred (200) copies of questionnaires using 3-likert scale and published documents. Both inferential and descriptive statistics was used. The mean cut off of 2.5 was taken as threshold for decision, and any item below 2.5 falls below average and considered negative. Chi-square was used for test of hypothesis which was rejected and the alternative hypothesis was accepted. The findings revealed that major marketers complied more than the independent marketers and the NNPC. It further revealed that the environmental regulations followed by a successful implementation and monitoring, will improve petrol stations level of compliance with environmental laws and regulations. The study recommends the need to reassure the petrol station operators that environmental legislation and environmental regulation requirements are not punitive, but guidelines to help conserve the environment.

Keywords: Siting, Petrol Stations, Compliance to Environmental Regulations, Taraba, Nigeria

INTRODUCTION

The environment offers man several vital services, natural resources, amenities, life support systems and opportunities to produce and dump wastes. 'The environment provides life-support system to man' (Oruonye & Ahmed, 2020). The environment throughout the years has gone through alterations by both economic, political and ecological powers, to the degree that the example of its transformative pattern can't be utilized with a high degree of precision in predicting the nearest future.

The human population is expanding at geometrical rate, particularly in the non-industrial nations, prompting extending metropolitan turn of events, development works and horticultural practices that are infringing minimal terrains. Similarly, industrialization through pollution is concomitantly threatening life-supporting resources on the earth. These difficulties are additionally exacerbated by developing catastrophic events, for example, earthquakes, volcanic eruptions, drought, cyclones, floods and mass wasting, among others. However, policies and institutional frameworks on the environment remain comatose (Ichite, 2017). Environmental degradation in various nation locations seems to match with an upsurge of fierce contentions in places, particularly in the course of the most recent twenty years.

Considering the high risk and dangers associated with petroleum as a highly inflammable product, its exploration, transportation, offloading, storing, and sale points and facilities should not be taken for granted like other products. According to World Health Organization (WHO, 2004), more than 2.3 million lives and properties worth more than N4.5 billion are lost to fire outbreaks associated with petroleum product mishandling. As reported by the European Environmental Agency (EEA, 1994), besides creating environmental hazards, petrol can also pose health hazards if inhaled, ingested, or come into contact with the skin or eye. European Fuel Oxygenates Association (EFOA, 1999) equally noted that exposure to petroleum vapor with a concentration of between 500ppm and 1000ppm could cause respiratory tract irritation. If the situations continue thereafter, such could lead to narcotics effects with headaches, nausea, dizziness and mental confusion. However, in the Jalingo metropolis, petrol stations are being sited where the obstruction to traffic and endanger people's lives. The siting of petrol stations without compliance to the standard set by regulatory agencies, the environmental implications and dangers pose to man by this action are imminent.

Petroleum products are unrivalled resources in several aspects of human life, which are mostly obtained from petrol stations. In Nigeria, most petrol stations are located within densely built urban spaces because of the need to maximize access to customers, security and ease of transportation, among others. Jalingo metropolis like many urban areas, has many petrol stations to satisfy its inhabitants. Important as petrol stations are; they are potential sources of environmental hazards. Apart from the effect of petrol stations on the environment, it can also affect the health of the people in the neighborhoods, buyers and the operators of the petrol stations. Consequently, petroleum products as flammable liquids can float on the water surface over considerable distances, thereby posing a danger away from the source to different shades of commuters.

In view of the above, Bello & Anobeme (2015) researched the effects of oil spillage on the properties of soil and environment around the marketing outlets of some petroleum marketing companies in Calabar, Cross River State, Nigeria with the result showing that oil spills negatively affect the chemical and biological properties of soils viz-a-viz the crops or vegetation in the surrounding. As part of the proactive measures by the government to preserve the environment and protect its inhabitant from hazardous waste, the Nigerian government and several states therein have established various governmental authorities and agencies that would ensure an efficient and effective mode of managing environmental issues. Taraba Environmental Protection Agency (TEPA) and Taraba State Urban Plan Development (TSUPD) liaise with relevant departments such as the Department of Petroleum Resources (DPR) to manage environmental issues associated with the operation of petrol stations and ensuring compliance with the environmental regulations. Unfortunately, in Jalingo, there are no clear-cut roles or hierarchy from the federal government on the subject matter. This could have led to the lack of study on petrol stations in Jalingo as it relates to compliance or environmental degradation.

Therefore, this study investigated the siting of petrol stations and compliance to environmental regulations in the Jalingo metropolitan area. The objectives of the study are to; (i) Assess the effect of siting petrol stations in the Jalingo metropolis, (ii) compare the compliance level of the three categories of the petrol stations (NNPC, Major marketers and Independent Marketers) and (iii) identify the factors that influence the location of petrol stations in the Jalingo metropolis. One hypothesis was set to guide the study, and it is:

Ho: there is no significant compliance to environmental regulations standard in the siting of petrol stations in Jalingo metropolis.

Hi, there is significant compliance to environmental regulations standard in the siting of petrol stations in Jalingo metropolis.

MATERIALS AND METHODS

Area of the Study

Jalingo, as the administrative headquarter of Taraba State, is located between latitudes $8^{o}47'$ to $9^{o}01'$N and longitudes $11^{o}09'$ to $11^{o}30'$E. It is bounded to the North by Lau, Yorro, and Ardo Kola Local Government Area. Jalingo town was founded in 1893 as a convenient and suitable site for the relocation of the administrative center of the Muri emirate (Oruonye, 2011). Agriculture is the major occupation of the people of Jalingo, crops produced include groundnuts, maize, rice, sorghum, millet, cassava, sweet potatoes and yam are produced in commercial quantity. It has a total land area of about $195km^2$ and has a population of 139,845 people according to the 2006 population census.

Presently, Jalingo town is experiencing an increasing population and shortage of infrastructural facilities, including road connectivity. The past and the present government embarked upon the urban road network construction to improve connectivity in the road network within the town and facilitate the movement of people and flow of commodities within the metropolis (Oruonye, 2011). Road construction is also meant to help expand the metropolis to accommodate the increasing urban population and the need for more social amenities such as housing. As an emerging urban complex, Jalingo has developed a more or less linear settlement pattern dictated by the nature of its topography.

Rivers Lamurde & Mayo-goi together almost limited the growth of the town on the southern part for a long time (Oruonye, 2011). The construction of new roads and bridges along significant rivers that bordered the town on the southeast and southwest has opened up large areas for urban growth. The present government has embarked on the dualisation of an 18km road from Sibre through Kpantinapu contract with six pedestals bridges and a flyover at the busiest junction of town (roadblock). This is to decongest highway, and linking township junction is said to have about 35% of the total traffic reduction of about 32% in total emission. As a result of those

mentioned above, there has been mass/proliferation of petrol stations within the major township street over the years to do good business.

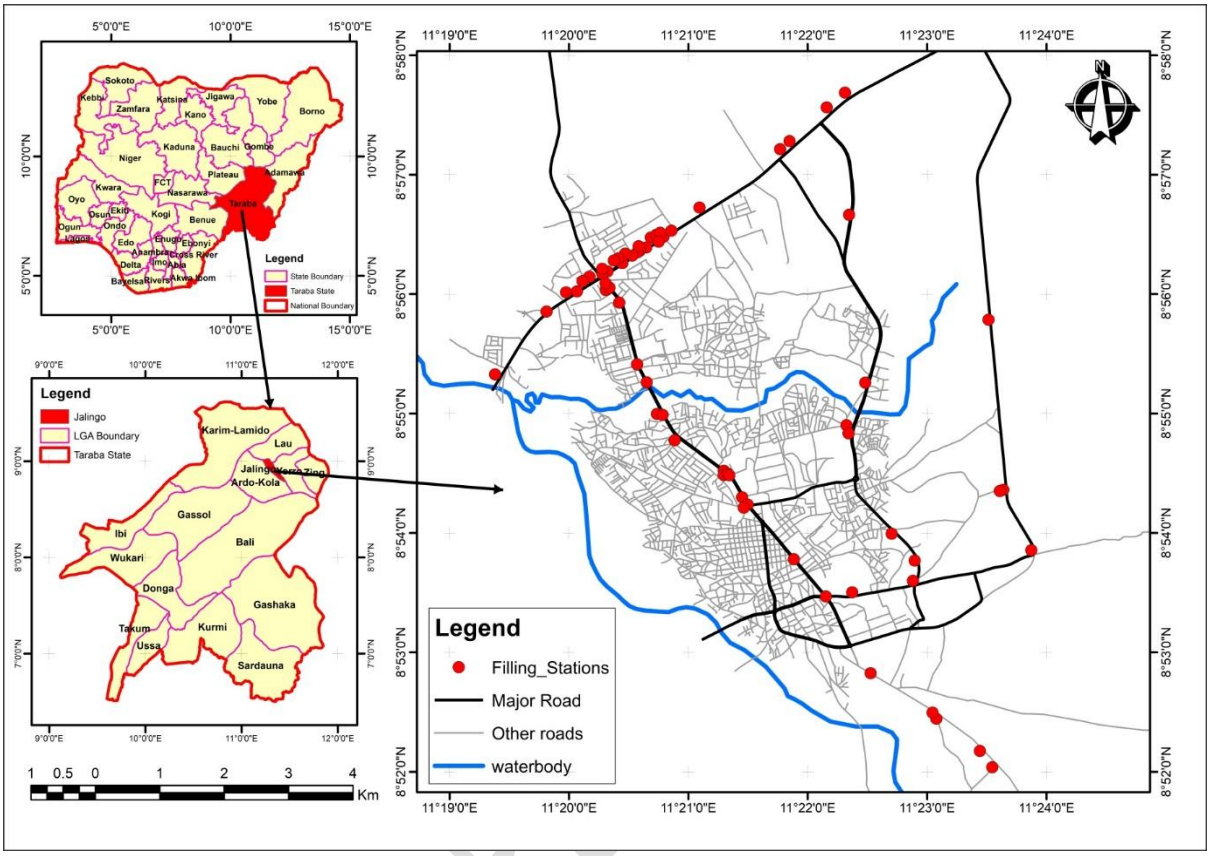

Fig 1: The spatial distribution of petrol stations in the study area

Methods:

The study adopted the survey design. Haradhan (2020) defines survey research as the process of collecting data to describe and interpret existing conditions, prevailing practices, beliefs, attitudes, ongoing processes. The petrol stations examined were selected from the list of all licensed petrol stations in Jalingo metropolis from the Department of Petroleum Resources (DPR) zonal office in Jalingo. The petrol stations were visited so as to be sure they were not decommissioned. Information on the laws and regulations relating the operation of petrol stations in Nigeria and Taraba State (Jalingo) were obtained from National Environmental Standard and

Regulation Enforcement Agency (NESREA), Taraba State Environmental Protection Agency (TSEPA), National Oil Spills Detection and Regulation Agency (NOSDRA), and State Fire Service (SFS).

The Sources of Data: The data for the study was obtained from primary and secondary sources. The primary source was from well-structured self-administered questionnaires that was administered to respondents during field surveys, where respondents had recorded their responses to the questions asked by the researcher. The secondary data was sourced from DPR (zonal office, Jalingo), NESREA (zonal office, Jalingo) NOSDRA (zonal office, Jalingo) SFS (Jalingo office) TSEPA and complimented from printed text, journals and literatures. The population frame for this study includes; the petrol station owners, the attendants and the neighborhood. Information from the DPR shows that there are seventy-six (76) petrol stations within the nook and crannies of the metropolis (4 mega stations, 5 major marketers and 67 independent managed petrol stations).

The petrol stations were divided into three stratums base on their ownership, which were NNPC managed stations, major marketers and independent managed petrol stations. In each of the stratums, a random sampling technique was used for the selection of petrol stations sampled. Altogether, 20% of each of the stratum was randomly selected which gave a total of 4,5, and 11 petrol stations accordingly. Hence this study was based on twenty (20) petrol stations as representative of all petrol stations in the Jalingo metropolitan area. A total of two hundred copies of questionnaires was used. In each petrol station, 10 copies of the questionnaires were administered. The Chi-Square (x2) was used to test the stated hypothesis.

Results and Discussion:

Table 1: Socio-Demographic characteristics of respondents

Demographic variable	**Grouping**	**Frequency**	**Percentage (%)**
Sex	Male	120	60%
	Female	80	40%
	Total	**200**	**100%**
Age	21-25	100	50%
	26-30	40	20%
	31 and above	60	30%
	Total	**200**	**100%**
Category of oil marketer:	**NNPC**	30	15
	Major marketer	40	20
	Individual Owners	130	65
	Total	**200**	**100%**

Source: Field Survey, 2021

Table 1 shows the socio-demographic characteristic of the respondents in terms of sex, age and marital status. Table 1 shows that 120(60%) respondents are males while 80(40%) are females. 100(50%) of respondents are between the age of 21-25 years, while 40(20%) are between the ages of 26-30 years, and 60 (30%) are within the age of 31 years and above. On the basis of ownership, 30(15%) of the respondents were owned by NNPC, 40 (20%) were major marketers, while 134(65%) are owned by individuals.

Table 2: The effect of siting petrol stations in Jalingo Metropolis.

S/N	ITEMS	A 3	D 2	N 1	X	SD	DECISION
1	Increase in vehicle traffic within the neighbourhood	170	30	0	2.8	0.7	Accepted
2	Increase in commercial activities	194	6	0	3.1	0.8	Accepted
3	Increase in air pollution	166	34	0	2.6	0.6	Accepted
4	Deterioration of roads	168	32	0	3.0	0.8	Accepted
5	It can lead to a fire outbreak	195	5	0	3.1	0.9	Accepted
6	A decline in the health of individuals	164	36	0	2.8	0.7	Accepted
7	Over-utilization of water resources in the area	153	47	0	2.6	0.6	Accepted
8	Over-utilization of electricity in the area	197	3	0	3.2	0.9	Accepted
	Mean magnitude	=			**2.9**		

Source: Field Survey, 2021

Table 2 shows the effect of siting petrol stations in Jalingo Metropolis. On the increase in vehicle traffic within the neighborhood, results show that 170 respondents agreed that siting petrol stations in the environment lead to an increase in vehicle traffic within the neighbourhood, 30 disagreed, while none of the respondents was neutral with the statement with the mean of 2.8 and 0.7 standard deviations. On the increase in commercial activities, the study reveals that 194 respondents agreed that siting petrol stations in the environment lead to an increase in commercial activities, however, 6 respondents disagreed, thus, giving a mean of 3.1 and 0.8 standard deviation. Similarly, the result shows that 166 respondents agreed with the statement that siting of petrol station lead to increase in air pollution in the study area, while 34 respondents disagreed, and none was neutral with the mean 2.6 and 0.6 standard deviations.

On the respondent's assessment of role of sitting of petrol station on road deterioration, the result in table 2 reveals that 168 respondents agreed that siting of petrol station leads to the road deterioration, while 32 respondents disagreed with the mean of 3.0 and 0.8 standard deviation. Furthermore, 195 respondents agreed that siting of a petrol station on the in the Jalingo metropolis could lead to fire outbreak, while only 5 respondents disagreed and none was neutral with the mean of 3.1 and 0.9 standard deviation. Table 2 further shows that 164 respondents agreed that siting of a petrol station on the environment could lead to a decline in the health of individuals, whereas 36 disagreed with the statement. Item 7 shows that 153 respondents agreed that siting of a petrol station in the study area could lead to over utilization of water resources in the area, whereas 47 disagreed with the statement. Again, the result Table 2 reveals that 197 respondents agreed that siting of petrol station leads to over-utilization of electricity in the area, while 3 respondents disagreed, and none was neutral with the mean of 3.2 and 0.9 standard deviation.

The result presented showed that all the outlined items as statements were accepted with a grand mean of 2.9 and 0.8 standard deviation. These finding agrees with the result of an earlier study in a different location by Mshelia, Abdullahi & Dawha (2015), who carried out research on the environmental effects of petrol stations at close proximities to residential buildings in Maiduguri and Jere, Borno State. It also agrees with some of the findings of another study in Port Harcourt by Amakiri-whyte et al., (2021), the findings revealed that the environmental problems of developed petrol filling station in residential domain are also numerous and such are volatile organic compound, methane and carbon monoxide to mention a few.

Table 3: The level of compliance among the petrol stations in the Jalingo metropolis.

S/N	ITEMS	A 3	D 2	N 1	X	SD	DECISION
1	The site does not lie within a pipeline or PHCN high tension cable Right of Way (ROW).	196	4	0	3.2	0.9	Accepted
2	The distance from the edge of the road to the nearest pump is not more than 15 meters.	171	29	0	2.9	0.9	Accepted
3	The distance between the station and the residential buildings will not be less than 100 (one hundred) meters	189	8	3	3.1	0.9	Accepted
4	The distance between an existing station and the proposed one will not be less than 400 (four hundred) meters.	186	14	0	3.1	0.8	Accepted
5	The drainage from the site goes into a stream or river.	196	4	0	3.1	0.9	Accepted
	Mean Magnitude = 3.1						

Source: Field Survey 2021

Table 3 presents the level of compliance to environmental regulations among the petrol stations in the Jalingo metropolis. The item 1 in the table 3 shows that 196 respondents agreed there is a high level of compliance among the petrol stations in the Jalingo metropolis, and 4 disagreed, with the mean of 3.1 and 0.8 standard deviation. Item 2 reveals that 171 respondents strongly agreed that the distance from edges of the road to the nearest pump is not be more than 15 meters while 29 respondents disagreed with a mean of 2.9 and 0.9 standard deviation.

Similarly, Item 3 shows that 189 respondents agreed that the distance between the stations and the residential buildings will not be less than 100 (one hundred) meters whereas 8 respondents disagreed and 3 was neutral with the of 3.1 and 0.9 standard deviation. However, Item 4 shows that 186 respondents agreed that the distance between an existing station and the proposed one will not be less than 400 (four hundred) meters., whereas 14 respondents disagreed with the mean of 3.1 and 0.8 standard deviation. Item 13 shows that 196 respondents agreed that the drainage from the site should not goes into a stream or river, whereas 4 respondents disagreed with the mean of 3.1 and 0.9 standard deviation.

From the result presented in table 3, the items mentioned are the differences in the level of compliance among petrol stations in the Jalingo metropolis with the grand mean of 3.1 and 0.88 standard deviation. The result presented sought to find out the difference in the level of compliance among the petrol stations in Jalingo metropolis with a grand mean of 3.1 and 0.9 standard deviation. All the statements were accepted, signifying total compliance with laid down rules. These statements are in agrees with Makelene (2015) who investigated the potential to improve firms' compliance with environmental standards by implementing an environmental regulation within a public firm and a private firm in South Africa

Table 4: Factors that influence the location of petrol stations in the Jalingo metropolis.

S/N	ITEMS	A 3	D 2	N 1	X	SD	DECISION
1	Nearness to a prospective customer base	187	13	0	3.2	0.9	Rejected
2	The purchasing power of residents in an area	190	10	0	3.1	0.8	Accepted
3	Traffic flow in the area	197	3	0	3.1	0.8	Accepted
4	Nearness to competitors	185	15	0	3.1	0.8	Accepted
5	Proximity to a major travel route	166	34	0	3.0	0.8	Accepted

6	Availability of basic infrastructure in the area	182	18	0	3.1	0.8	Accepted
7	Visibility of a nearby road	185	15	0	3.0	0.8	Accepted
8	Rent paid by residents in the area	175	25	0	3.2	0.9	Accepted
9	Nearness to a prospective customer base	176	24	0	2.9	0.7	Accepted
	Mean Magnitude = 3.1						

Source: Field Survey 2021

The factors that influence the location of petrol stations in the Jalingo metropolis is presented in Table 4. In item 1 in the table 4, 187 respondents agreed that nearness to a prospective customer base influence location of petrol stations in the Jalingo metropolis, while 13 respondents disagreed with the statement with the mean of 3.2 and 0.9 standard deviation. In Item 2, 190 respondents agreed with the statement that purchasing power of residents in an area determines the petrol station's location, while 10 disagreed with the mean of 3.1 and standard deviation of 0.8.

Similarly, Item 3 reveals that 197 respondents agreed to traffic flow in an area, determine the location of petrol stations, while 3 respondents disagreed with the mean of 3.1 and 0.8 standard deviation. Item 4 shows that 185 respondents agreed that nearness to competitors is a factor that affects the location of petrol stations while 15 respondents disagreed with the statement with a mean of 3.1 and 0.8 standard deviation. Furthermore, Item 5 reveals that 166 respondents agreed that proximity to the travel route is one factor that influences the location of a petrol station while 34 respondents disagreed with the statement with the mean of 3.0 and 0.8 standard deviation. In Item 6 of the table 4, 182 respondents agreed that the availability of infrastructure in an area is a determining factor for siting petrol station whereas 18 respondents disagreed with the mean of 3.1 and 0.8 standard deviation.

In terms of visibility as shown in Item 7 revealed that 185 respondents agreed that the visibility of a nearby road is a major factor influencing the sitting of petrol station whereas 15 respondents disagreed with the mean of 3.0 and 0.8 standard deviation. Meanwhile, Item 8 reveals that 175 respondents agreed that the rate of rent paid by residents in an area influence location of a petrol station while 25 respondents disagreed with a mean of 3.2 and 0.9 standard deviation. Finally, item 9 reveals that 176 respondents agreed that nearness to a prospective customer base influences the siting of a petrol station while 24 disagreed with a mean of 2.9 and a standard deviation of 0.7. Based on the result presented in table 4 with a grand mean of 3.1 and standard deviation of 0.8, we can infer that all the factors as mentioned influenced the siting of petrol stations in Jalingo metropolis. This finding is congruent with Mohammed, Musa & Jeb (2014) who analyzed the location of petrol stations based in Metropolitan Kano against the Physical Planning Standards using GIS.

Hypothesis Tested: H_0 -There is no significance compliance to environmental regulation set standard in siting of petrol stations in Jalingo metropolis

Table 5: Hypothesis Testing: Using the Chi Square

0	**E**	**0-E**	**$(0 - E)^2$**	**$\frac{(0 - E)^2}{E}$**
147	50	97	9409	188.18
49	50	-1	1	0.02
2	50	-48	2304	46.08
2	50	-48	2304	46.08
200	50	**0**		**280.36**

Source: Field work 2021

Level of significance is 5% (0.05)

Degree of freedom = n – 1

= 4 – 1

Df = 3

Table value = 144.3

Therefore, since the calculated Chi Square (X2) = **280.36** and the table value = 144.3. Since the X^2 calculated was **280.36** which is greater than the table value 144.3, the null hypothesis (Ho) is rejected and the alternative hypothesis (Hi) is accepted. This means that there is significance compliance to set standard in siting of petrol stations in Jalingo metropolis. This result is also congruent with the result of Taylor et al (2016) in Zambia who found that entrepreneurs preferential location choices is positively related to location of filling stations; and planning principles, standards and regulations positively influence locations of filling stations in the City of Kitwe based on a t-test statistics.

Conclusion and Recommendation

Environmental Regulation addresses the management of environmental impacts related to the operation of a petrol station. The environmental regulation has the potentials of managing, mitigating and monitoring the environmental impacts associated with the operational phase of the petrol stations. The general conclusions drawn from this study vis-à-vis the objectives are

that the level of compliance to environmental regulation set standard is below average, especially among NNPC managed stations and independent marketers. Various areas which show lack of compliance to the environmental regulation, which at the end result in environmental damage, have been identified and are linked to the activities of the petrol stations within the area, such as lack of leak and spill detection measures, inadequate fire extinguishers, sand buckets, and lack of oil-water separator among others. This was attributed to constraints such as profit maximization, cost of implementation and maintenance, inadequate training and enlightenment programmes and ignorance on the lack of knowledge on the significance of the environmental regulations.

This study provides a foundation on which to improve compliance to environmental regulation by petrol stations in the country. It is clear that the petrol stations are aware of the potentials of environmental regulation in ensuring environmental management of their activities. Therefore, the petrol stations will comply more with environmental laws and regulations if the agencies saddled with the responsibility of ensuring environmental compliance can use the environmental regulation to monitor their compliance.

Recommendations

This study provides baseline information on the extent of compliance to environmental regulation by petrol stations in the Jalingo metropolis and the major constrain factors to environmental regulation implementation in the petrol station. This could be useful for future research on assessing environmental compliance to environmental regulation and enforcement in Jalingo metropolis and Taraba state at large. Based on the findings, the following recommendations have been advanced.

There is a need to reassure the petrol station operators that environmental legislation and environmental regulation requirements are not punitive, but guidelines to help conserve the environment and that improving the environmental performance of fuel stations is important as they are part of the business society that can potentially contribute to sustainable development through improved environmental performance, resulting in significant economic benefits in the long and short term.

At the institutional level, there needs to be more coherence and clarity of regulatory functions. In addition, the regulatory bodies should ensure fairness and strengthen the credibility of regulatory requirements: consistent and effective compliance and enforcement mechanism by making both penalties and the probability of detection high enough that it will become unprofitable and therefore irrational for regulated petrol stations to violate the law. Without an effective compliance assurance program, stations that violate environmental requirements may benefit compared to those that choose to comply. Ultimately, complied stations will be more unlikely to comply if they perceived that it placed them at a competitive disadvantage with noncompliance stations. This is the long run, will reduce the level of compliance if not properly handled.

It is important for the respective regulatory agencies to devise a way of reducing the cost as well as the paperwork involved. In order to reduce the cost associated with environmental regulation implementation, it would be important for the agencies responsible for encouraging environmental management benchmarking to allow similar sectors to collaborate in developing environmental regulation. In addition to benchmarking strategy, it would be important for the regulatory body to encourage environmental regulation implementation by involving some of

their officers to assist in petrol stations to implement the plan or during the review after implementation.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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