An Assessment on the Level of Compliance in Handling and Disposal of Spent Oils from Retail Fuel Service Stations in Gwarinpa District of Abuja, Nigeria

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Abstract:
Protecting the environment from the activities of retail fuel service stations requires proper monitoring and enforcement of environmental regulatory standards by regulatory bodies and adequate compliance by operators. The research sought to determine the level of compliance to environmental regulations among retail fuel service stations within Gwarinpa District of Abuja, Nigeria in the handling and disposal of spent oils. Questionnaires, field observations of the facilities and interviews were used to collect relevant information from the respondents and regulatory agencies. The research conducted a census of all seven retail fuel service stations within the GWARINPA District. Quantitative and qualitative techniques were used in analysing data such as content analysis and descriptive statistics. Results showed that majority of the retail fuel stations activities in the handling and disposal of spent oil were non-compliant to existing regulations stipulated by the Department of Petroleum Resources(DPR) and National Oil Spill Detection and Response Agency (NOSDRA). In the light of the above, the research recommended the need for operators to create awareness and train staff on environmental best practices and also ensure implementation of these practices. There is also need for regulatory bodies to improve on enforcement strategies.

Keywords: Spent oil, Contamination, Compliance, Enforcement.

1.0 Introduction:

This work is a preliminary research of an ongoing research in the handling and disposal of spent oils generated from automobile service sections of retail fuel service stations in the GWARINPA district of Abuja, Nigeria. This work is peculiar as this research work has not been carried out in the study area. The retail fuel service station business and industry depend on the environment as a resource, functionality and eventually waste disposal and with that have a critical role in supporting the world to achieve sustainable development (Redmond, 1991). Retail fuel service stations are facilities which serve the purpose of dispensing petroleum products to the consumers for fuelling engines through pumps and dispensers from Underground Storage Tanks (USTs). Retail fuel service stations are considered essential to communities in developed society. Most retail outlets usually have automobile service workshops attached to them. These automobile service workshops contribute as major sources of pollution that needs to be contained and controlled. Wastes generated from activities of the retail outlets include amongst others spent oils mostly generated from the automobile service sections. The regulatory bodies saddled with the responsibility of ensuring compliance in the management and disposal of oil contaminated solid wastes and sent oils generated from retail fuel service stations are the Department of Petroleum Resources (DPR), National Oil Spill Detection and Response Agency (NOSDRA) and National Environmental Standards Regulatory and Enforcement Agency (NESREA). For the purpose of this research, regulations from DPR and NOSDRA which are the main regulations for the handling and disposal of spent oils will be used to assess compliance. As one of its statutory functions, the DPR is required to ensure that petroleum industry operators do not degrade the environment in the course of their operations while NOSDRA is required to restore and preserve our environment by ensuring best oil field, storage and transmission practices in exploration, production and use of oil in the quest to achieve sustainable development in Nigeria.

This research aims at evaluating the level of compliance of retail fuel service stations to environmental regulatory standards in the handling and disposal of spent oils. The areas of enquiry include the following;

- Assessing level of regulatory awareness and training of retail outlet personnel in the handling and disposal of spent oils.
- Examining the means of handling and disposal of and spent oils.
- Assessing level of enforcement activities of responsible regulatory bodies (DPR and NOSDRA).

The findings of this research would be valuable to policy makers and regulators as it would inform on the need to carry out regular monitoring and enforcement on spent oil management practices and the necessity in enforcing compliance to best environmental practices. This would also inform future policy development and enforcement efforts to ensure full best practice compliance.

This research will assess level of compliance of retail fuel stations to environmental best practice. The research tries to identify likely determinants of the compliance and its effect on sustainable development via environmental sustainability. The research identified the determinants of compliance to environmental best practice as training and awareness of respondents and the enforcement strategies of relevant regulatory bodies such as the Department of Petroleum Resources (DPR) and National Oil Spill Detection and Response Agency (NOSDRA) through their Regulations; EGASPIN Part VII, Section B 4.3.1.5 and Acts; NOSDRA's ACT Part IX 144 respectively.

Sustainable development aims at meeting the needs of the present without compromising the ability of the future generations to meet their own needs. It has been defined by Brundtland's Commission (1987) as a better quality of life for everyone, now and for generations to come. Environmental sustainability refers to the long-term maintenance of valued environmental resources in an evolving human context. According to ESI (2005), A country is more likely to be environmentally sustainable: *to the extent that its vital environmental systems are maintained at healthy levels, and to the extent to which levels are improving rather than deteriorating; if the levels of anthropogenic stress are low enough to engender no demonstrable harm to its Environmental systems; to the extent that people and social systems are not vulnerable to* *environmental disturbances that affect basic human wellbeing; becoming less vulnerable is a sign that a society is on a track to greater sustainability; and to the extent that it has in place institutions and underlying social patterns of skills, attitudes, and Networks that foster effective responses to environmental challenges;*

1.1 Study Area:

Gwarinpa District is mainly a residential area with some businesses especially service oriented businesses like banks, filling stations and eateries are springing up very rapidly. It is located at an elevation of 576 meters above sea level. Its coordinates are 9°5'58" N and 7°24'29" E in DMS (Degrees Minutes Seconds) or 9.09944 and 7.40806 (in decimal degrees). Its UTM position is LR20 and its Joint Operation Graphics reference is NC32-09. The standard time zone for Gwarinpa is UTC/GMT+1 (Google map, 2017). There is also another residential area called Life-Camp in the GWARINPA district which contains staff quarters of Construction companies. Places near GWARINPA Wuse Kado Utako Dawaki Durumi Kubwa Karsana Jahi Karumo. The total number of retail fuel service stations in GWARINPA is seven. Below is a map showing GWARINPA district amongst other developed districts.
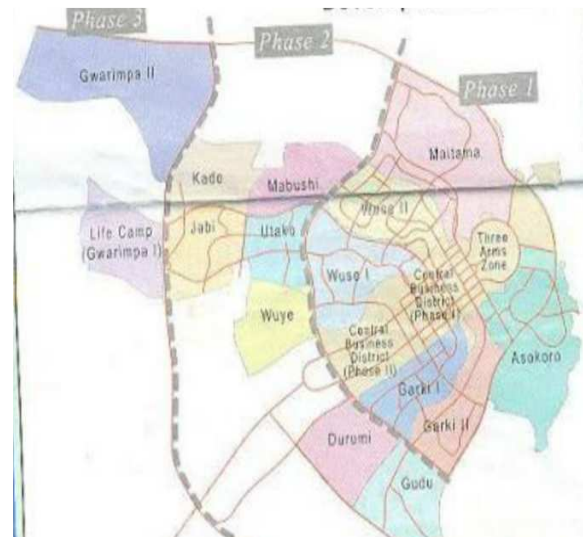

Figure 1.1: Gwarinpa District

1.2 Spent Oils:

Spent oil also known as "waste" or "used" oil is any oil that has been refined from crude or synthetic oil, has been used and as a result of the use is contaminated by physical or chemical impurities *(Used Oil Management, 2014)*. Osubor & Anoliefo (2003), reports that Nigeria accounts for more than 87 million litres of spent oil annually and adequate attention has not been given to its proper disposal. Automobile service point located within the fuel stations are major generators of spent oils as a result of their activities within the fuel station. Spent oils are considered wastes due to its contamination by chemical impurities. This therefore contributes to chronic hazards including mutagenicity and carcinogenicity as well as environmental hazards with global ramifications (Udeani *et al.*, 2009). The indiscriminate disposal of spent oil into the environment by motor mechanics results in an increase in pollution incidents in the environment (Anoliefo *et al*., 2001). These indiscriminate activities among all persons handling petroleum products and their waste call for proper management and compliance of best practice to Environmental legislations (Kanyi, 2014).

The sources of pollution that have been identified by the Department of Petroleum Resources (DPR) with retail outlets include: Spills arising from the sales of petroleum products as a result of overfilling of fuel tanks of automobiles and boats; Used engine oil (automobile drain oil or waste oil) generated from automobile services; Leaks from underground storage tanks due to corrosion, accident to the vehicle tanker during product discharge, oil spillage and usage of inferior construction material; Sanitary wastes; Drainages from car wash and storm water and Refuse (Department of Petroleum Resources [DPR], 2002). Used oil from automobile engines contributes immensely towards the degradation of the environment which is as a result of poor handling and ignorance of major disposers of used oil (Zitte et al., 2016). Used oils if not properly disposed can cause contamination to other useful oils as they primarily contain hydrocarbons and sometimes additives such as lead and other impurities due to physical contamination and chemical reactions which occur during usage hence cause changes in the chemical and physical nature of virgin oils. **(**Usman et al., 2011**)**.

Used oil resources which has been identified in Nigeria as mainly industrial and transportation based have poor management strategies as is evident in most petroleum producing facilities. It is hoped that the Ministry will make provision for the very much needed research and technological backup for such project whose requirements for success transcend mere fabrication (Bamiro & Osibanjo, 2004).

Figure 2.1: Showing an automobile service section

1.3 Effects of Indiscriminate Disposal of Spent Oils:

The discovery of oil has gone a long way in developing several parts of the world and as such its production and consumption is vital to international relations (Eze, et al 2011). As much as oil production and consumption is of great economic importance, it also poses several disadvantages. One of which is its negative impact on the earth's biosphere releasing pollutants and greenhouse gases into the environment and damaging ecosystem through events such as oil spillage (Timothy, 2006). Most of this facilities dump spent oil indiscriminately into the environment (grassland or drainages) in ways that do not conform to environmental best practices and therefore leading to a lack of compliance to environmental legislations. Contamination may present a risk to groundwater sources and to human health. Spent oils are often sold to individuals who in turn make use of these hazardous substances indiscriminately with little or no awareness to the dangers it poses to their health and environment. This is why risks from physical hazards, such as storage pits, should not be overlooked. Each stage of the management process should be assessed to establish any potential health and safety risks together with appropriate mitigating methods (IPIECA-OGP, 2012).

Improper disposal of waste oils in the vicinity of fuel filling stations contributes immensely to soil contamination; this may possibly have adverse impact on human health (Onyari J., et al 1991). Nriagu, J.O. (1990) suggests that as retail fuel service stations increase, measures must be taken to know the source, significance and concentration of this heavy metal pollutants as this creates a serious monitoring and control challenge as mechanic workshops and mechanic villages spring up every day and everywhere without plan and policy for management of waste and protection of the environment (Lale, 2014). However, at excess of specific limits, these metals adversely affect plant growth (Ikhajiagbe et al, 2013) and contamination by oil hinders germination, reduces crop yield and also leads to premature death of plants (Udom et al., 2012).

The study carried out by Okonkwo et al, 2014 on the environmental impact of petrol and gas filling stations on the air quality makes a good argument on the dangers of contamination by retail fuel service stations' activities when it showed that filling station located in Umuahia had the tendency to constitute health hazard risk owing to its contribution to air pollution. The study stated that different pollutants were recorded at the study areas namely; particulate matters, nitrogen dioxide, sulphur dioxide, volatile organic compounds, hydrogen sulphide, carbon monoxide and methane and these emissions originated from the following sources viz gasoline delivery to the stations, tank breathing which occurs due to temperature and pressure changes, during vehicle refuelling, emissions from loosely closed tanks and mishandling of the petroleum leading to spillage (Isabel, 2010). These emissions poses grave danger to the human health as EFOA, (1999) noted that exposure to petroleum vapour with a concentration of between 500ppm and 1000ppm can cause irritation of the respiratory tract and could lead to narcotics effects with symptoms including headache, nausea, dizziness and mental confusion.

M. S Dauda., et al (2012) in his study 'Heavy metals assessment of soil in the vinicity of fuel filling station in some selected local government areas of Benue State, Nigeria' stated that Heavy metals are released into the environment by both natural and anthropogenic sources. The natural sources being chemical weathering of mineral while anthropogenic sources are associated mainly with industrial, agricultural, mining and domestic activities, urban storm, water runoff, landfill leachate, mining of coal and ore, atmospheric sources and inputs rural areas (Kabata-pendias, A et al 1991, Jacob, D.L 2003).

2.2 Regulations on Disposal of Spent Oil:
DPR, (2012) stated that spent lubricants shall be differentially segregated from other oily effluents and channelled into a source recovery system where feasible or into a receptacle approved by the director of petroleum resources. The treatment and disposal methods for the spent oils shall be approved by the director of petroleum resources. These treatment and disposal methods shall include but not limited to recycling, incineration, etc. Refuse containers shall be provided for the recovery of oily rags, empty oil cans, etc. and disposed in accordance with public health and sanitation procedures, satisfactory to the Director of Petroleum Resources**.** Oil contaminated solid wastes, sludges, storm water, surface drainage and treated waste waters shall be appropriately stored and transported to a properly constructed integral depot facility for treatment using the best available technology to prevent the risk of oil spill and negative impact on the environment before disposal (NOSDRA, 2006).

1.4 Uses of Spent Oil
Most uses of spent oils are not environmentally friendly. Opeyemi M, and Benjamin T, (2004), *states* the following uses below as widespread sources of environmental degradation and ecological damage but harsh economic situation has encouraged some of these alternative uses with little regard for environmental impacts: Some industries use the spent oils as fuel for their boilers; used in the furnace as fuel; poured on the ground to control or kill weeds; poured on the ground and roads to suppress dusts; used as lubricant in mould equipment; used to prevent termites from destroying the wood; used engine oil is mixed with grease to produce gear oil; used as hair cream to protect the scalp from the burning sensation of hair relaxers; used as hydraulic in heavy duty vehicles equipped with tipping mechanism; used in addition to bitumen by some road construction companies; used for this purpose by those selling motor spare parts; used ball joint; as wood preservative; in treatment of open wounds as they believe it makes the wound heal better, this is common among motor mechanics; used as fuel in cooking with firewood and sometimes kerosene is mixed with used engine oils to produce diesel.

Figure 2.2:   Application of used oil to wood treatment

Figure 2.3: Pallets treated with used oil in block making

1.5 Environmental Law Enforcement Challenges

Environmental laws are made to protect and promote the natural environment, economic vitality and healthy communities which help create sustainable environment through interdependency. The interdependency of man with or within the ecosystem is fundamental to human existence (Okorodudu-Fubara, 1998). The need for environmental control arises from the fact that it brings improved health and better living conditions (Adelagan, 2004).

Major environmental problems in Nigeria arise as a result of the ineffective enforcement of environmental laws (Egbon & Behrooz, 1996). Several factors lead to the ineffective enforcement of environmental laws. One important factor is insufficient funding of relevant environmental regulatory agencies. To meet their obligations and be able to perform their functions effectively, the agencies must be financially viable (Okorodudu-Fubara, 1998). Inadequate funding results in lack of requisite human and material resources to undertake environmental management which further affects effective environmental law enforcement (Ogbuigwe, 1996). Threats from powerful individuals and groups who own industries challenge effective environmental law enforcement (Ijaiya & Joseph, 2014).

Lack of modern technology for environmental regulators is also a challenge of environmental law implementation. Ijaiya & Joseph (2014), stated that officers monitoring the environment do not have the effective modern equipment to enhance monitoring of some of the environmental problems. They further stated the discordance in the relationship among the tiers of government, limits the effectiveness in carrying out their environmental protection, monitoring and enforcement. Muhammed, (2012) in his review of NESREA's Acts and Regulation stated that the resultant consequence of several poor environmental compliance or weak enforcement regime were industrial pollution problems and their impact on the environment and human health in Nigeria.

2.0 Methodology

The study conducted a census survey of all seven retail fuel service stations within the GWARINPA district were all members of the population were included due to the small population size. Out of the seven retail fuel service stations that were assessed in the research, five were conglomerates and two independent private marketers. This study which is majorly a qualitative research uses both quantitative and qualitative approaches in analysing the data were content analysis and descriptive statistics were employed. The study also relied on data obtained from two main sources namely secondary and primary sources. Field investigation, questionnaire survey and face-to-face interview were employed to gather primary data and secondary data was obtained from books, articles and internet sources.

The compliance acts and regulations used in this study included the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) from the Department of Petroleum Resources (DPR) and the NOSDRA's ACT from the National Oil Spill Detection and Response Agency (NOSDRA). The questionnaires were of three types which were designed uniquely for each of the two respondents per station. These questionnaires were developed by assessing the environmental standards requirements of regulatory bodies (DPR and NOSDRA) as regards environmental best practices of retail fuel service stations. The questionnaires contained both closed and open ended questions which were given to the two respondents per station, comprising of a manager/supervisor and an automobile service personnel. The two respondents were selected for questioning from each retail stations based on their individual designations and work sections pertinent to the research. The managers were selected based on their supervisory and leadership role in overseeing and ensuring environmental best practices in the handling and disposal of spent oils generated within the station while the automobile service personnel were selected based on their role as generators of spent oil. The GWARINPA District was selected as sample area because it contained information relevant to the research.
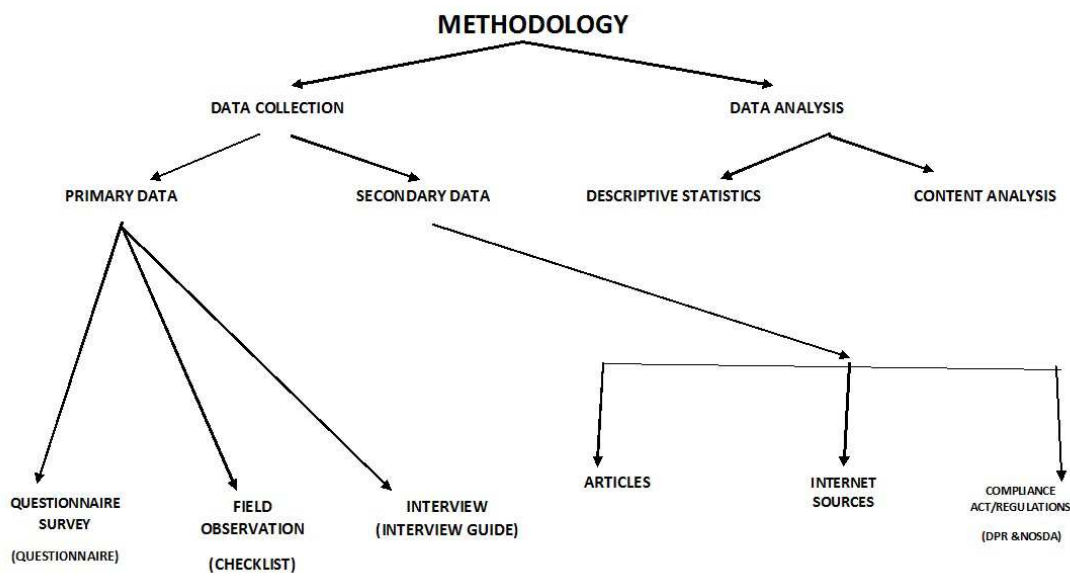

Figure 3.1: Showing flow chart of the methodology

Source: Researcher, 2017

3.0 Results/Data Analysis:
3.1 General Demography
The following questions made up the section for Demographic; Name of filling stations, Type of facility, Job descriptions, Age of respondents (Years), Sex of the respondent, Level of Education and Work Experience (No. of years). The study sought to find out the sex of respondents in the stations. The findings are presented in Table 4.1

Table 4.1: Sex of respondents in the stations

Sex/Personnel	Managers/ Supervisors	Automobile Personnel	Total
Female	-	1	1
Male	7	6	13
Total	7	7	14

The study sought to find out the level of education of respondents in the stations. The findings are presented in Table 4.2

Table 4.2: Level of education of respondents

Level of Education/ Personnel	Managers/ Supervisors	Automobile Personnel	Total
Primary	-	-	-
Secondary	2	4	6
Tertiary	5	3	8
Total	7	7	14

Source: Researcher, 2017

The study sought to find out the number of years respondents had worked in the stations. The findings are presented in Table 4.3
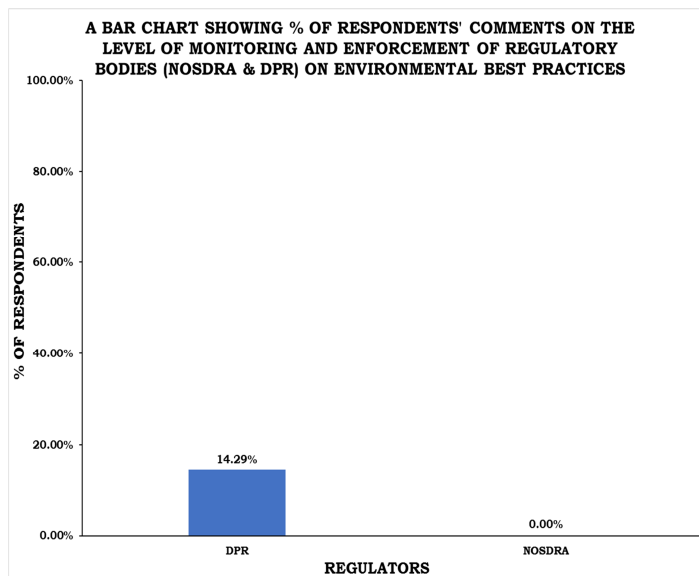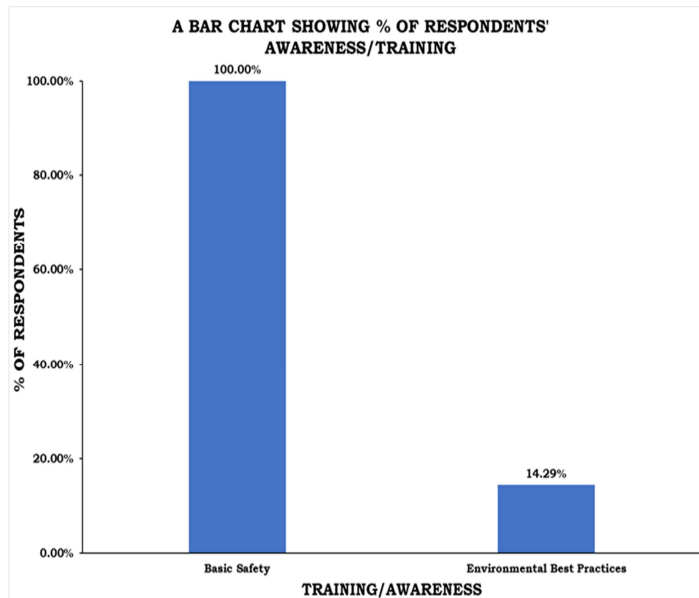
Table 4.3: Number of Years respondents had worked in the stations

Experience (Yrs)/ Personnel	Managers/ Supervisors	Automobile Personnel	Total
1 – 5	**2**	**3**	**5**
6 – 10	**3**	**3**	**6**
11 – Above	**2**	**1**	**3**
Total	**7**	**7**	**14**

Source: Researcher, 2017

3.2 Managers/Supervisors:

- 42.87% of respondents in this section were managers while 57.16% of respondents were supervisors.
- 100% of respondents fall between the ages of 25-40.
- 100% of the respondents were male.
- 71.45% of respondents had tertiary education while 28.58% had secondary school education.
- 28.58% respondents had between 1-5 years work experience, 42.87% had 6 -10 years work experience, while 28.58% had 11-15 years' work experience.

A BAR CHART SHOWING % OF RESPONDENTS' AWARENESS/TRAINING

A BAR CHART SHOWING % OF RESPONDENTS' COMMENTS ON THE LEVEL OF MONITORING AND ENFORCEMENT OF REGULATORY BODIES (NOSDRA & DPR) ON ENVIRONMENTAL BEST PRACTICES
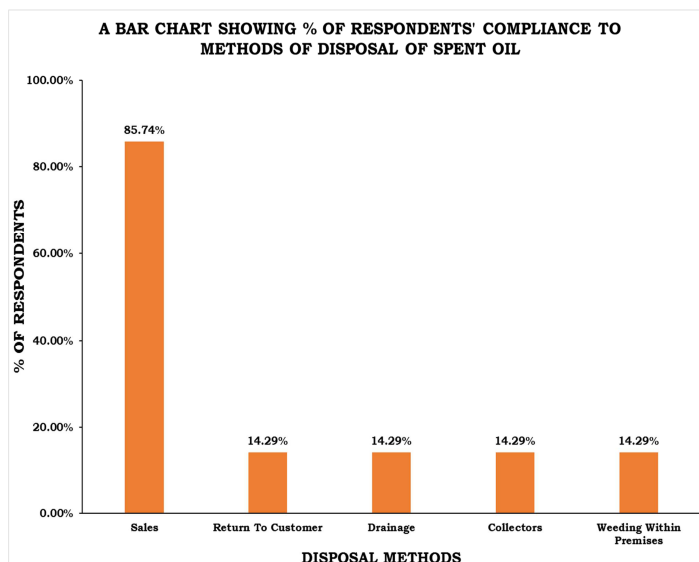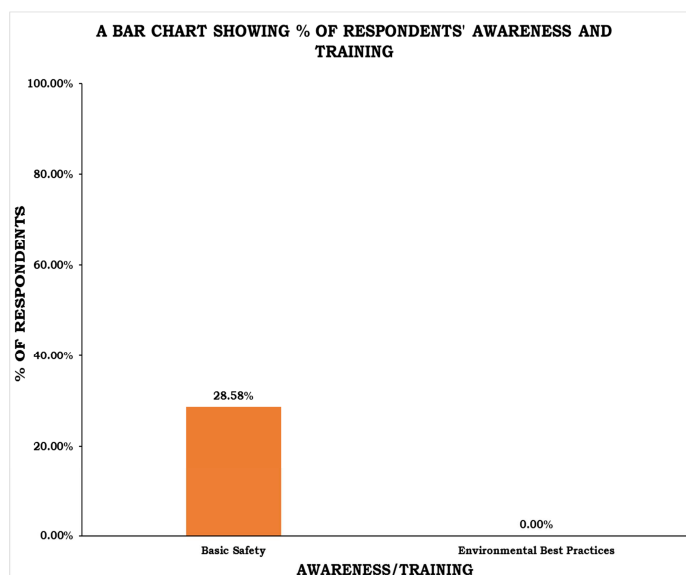
In the managers/supervisors section 100% of the respondents claimed to have basic safety trainings while only 14.29% of them had specific training on environmental best practices.In the managers/supervisors section 14.29% of the respondents claimed that DPR carried out frequent monitoring and assessment on their activities while 0% did not get any form of monitoring from NOSDRA.

3.3 Automobile Service Personnel
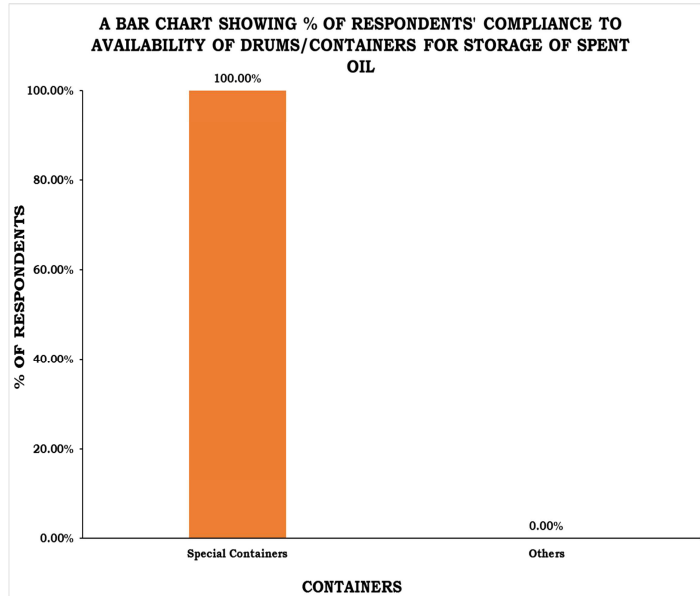• All respondents in this category fall between the ages of 28 – 45years,

• 85.74% of respondents were male and 14.29% female.
• 57.16% had education up to secondary school while 42.84% up to tertiary level.
• 42.84% of respondents have work experience of1- 5 years, 42.84% of respondents have work experience 6-10years, 14.29% of respondents have work experience 11-15years
• 42.87% of respondents generated 50-100litres of spent oil per month, 42.87% generated 101-200litres of spent oil per month and 14.29% generated between 201-250litres of spent oil per month.

A BAR CHART SHOWING % OF RESPONDENTS' AWARENESS AND TRAINING

A BAR CHART SHOWING % OF RESPONDENTS' COMPLIANCE TO METHODS OF DISPOSAL OF SPENT OIL
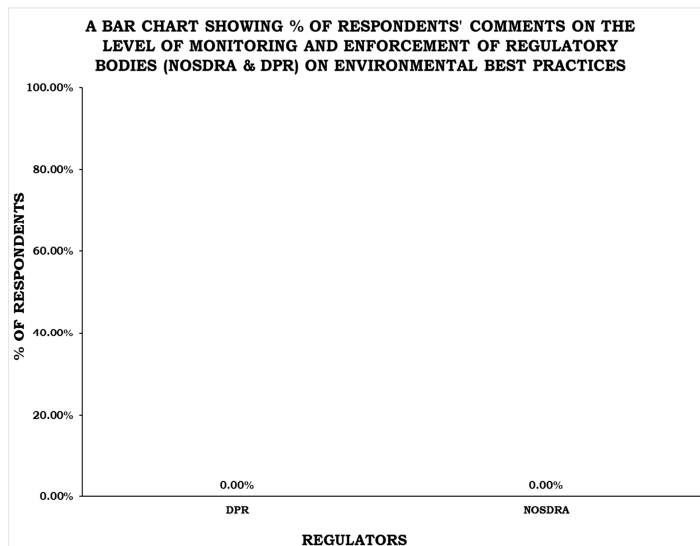
In the automobile service personnel section 28.58% of the respondents claimed to have basic safety trainings while 0% had no specific training on environmental best practices. This section shows various disposal methods of spent oils. 85.74% of the automobile personnel respondents sold off generated spent oil, 14.29% returned spent oils back to customer, 14.29% disposed spent oils in drainages, 14.29% gave to collectors who claimed to recycle spent oils while another 14.29% claimed to use spent oils generated to kill weeds within the station's forecourt. In all of this the only sustainable and compliant practice is the collection by collectors of the spent oils generated.

A BAR CHART SHOWING % OF RESPONDENTS' COMPLIANCE TO AVAILABILITY OF DRUMS/CONTAINERS FOR STORAGE OF SPENT OIL

In this section there was an absolute compliance in the storage of spent oils in specific compliant containers where 100% of the respondents claimed to compliant containers for storing spent oils.

A BAR CHART SHOWING % OF RESPONDENTS' COMMENTS ON THE LEVEL OF MONITORING AND ENFORCEMENT OF REGULATORY BODIES (NOSDRA & DPR) ON ENVIRONMENTAL BEST PRACTICES

In this section 100% of the automobile service personnel respondents claimed that they were neither monitored nor assessed by DPR and NOSDRA on environmental best practices. Generally, the findings show that majority of the retail fuel stations activities in the handling and disposal of spent oil did not comply totally with existing regulations stipulated by the DPR and NOSDRA. The findings further indicate that the reasons for lack of compliance of retail fuel stations are due to the lack of proper training and awareness of respondents in the handling and

168

disposal of spent oils and also due to ineffective environmental law enforcement strategy where most of the strategies and mechanisms are poor and not being implemented.

During this research, it was noted that the sample size used was small and may therefore need to be expanded beyond the GWARINPA district so as to have a more holistic approach to the study. Spend Oils Management is aimed at collecting waste engine oil used in motor vehicles by licensed and authorized crews in proper manners in car service stations, oil stations and public vehicle maintenance stations; and ensuring processing of these with avoiding harm to nature or humans and establishment of appropriate collection system, determination of oil producing sources and awareness raising. Used or spent oil collected in drums or suitable containers should be given to registered company for collection and recycling. Companies should be encouraged to deal with recyclers who have permit from relevant Environmental regulatory bodies. There is also the need for regulatory bodies to improve on enforcement strategies and mechanisms so as to ensure effectiveness in implementation and compliance with environmental best practices by retail fuel service stations.

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