CLIMATE CHANGE, TRANSPORTATION OF HAZARDOUS MATERIALS AND ENVIRONMENTALISM IN NIGERIA: A POLYCENTRIC ENVIRONMENTAL PLANNING PERSPECTIVE

[1]S. R. AKINOLA, PhD, D.[2]S. OGUNDAHUNSI & [3]S. B. ADEDOTUN
[1]Faculty of Environmental Sciences,
[1&2]Department of Urban & Regional Planning
Osun State University, P.M.B. 4494, Osogbo, Osun State, Nigeria

Abstract

Lopsided environmental planning skews the benefits of environmental resources towards the few in the corridor of power while the masses pay in cash and kinds. The transportation of hazardous materials (such as petroleum products) engenders the environment, causes degradation and compounds poverty whenever accident occurs. This paper found that between 2007 and June 2010, a total of 4,017 Tankers / Trailers accidents occurred on Nigerian roads in which a total of 4,076 persons were killed and 12,994 persons injured. The inferno that normally accompanied tankers accident has been noted for destruction of lives and properties. Analysis of tankers accident that involved 14 trailers and a private car, which claimed 46 lives at Ibadan shows that 58 properties were destroyed. Analysis shows that all the property owners were worst off in terms of compensation as none of the property owners received compensation up to 60% of the cost of renovating the affected properties. About 57% of the respondents lost their jobs due to the fire disaster. There is the need for an urgent intervention on the suitable and safe modes of transportation of hazardous materials, especially petroleum products. The required thing is to adopt effective polycentric environmental planning with people-centred decision making that compels kleptocratic capitalist bourgeoisies to comply with environmental standards, respect human lives and property in Nigeria. The intervention requires a new structure of governmentality that will prioritize polycentric environmental planning that can act as a check, under certain circumstance, on the excesses of capitalist bourgeoisies as well as provide greater opportunities for accountable government. The paper, therefore, charts a course of action that can be taken in order to set up machinery for monitoring the operation of HAZMAT transportation. Consequently, an African Polycentric Sustainable Environment Model (APSEM) is adopted to reducing vulnerability arising from HAZMAT accident.

Keywords: *Climate Change, Transportation, Hazardous Materials, Environmentalism, Planning*

Introduction

The challenge of climate change is predicated upon poor environmental planning and governance. Environmental governance can be described as the way society as a whole manages the full array of its politico-economic, and social environment by shaping the incentives available to individuals and local communities with regard to natural resources exploitation and utilisation. Governance plays significant role in the process of transforming country's resources into national development. The exploitation and utilisation of natural resources inform the development of commerce and industry in both private and public sectors of the economy.

Lopsided environmental planning skews the benefits of environmental resources towards the few in the corridor of power while the masses pay in cash and kinds. The

transportation of hazardous materials (such as petroleum products), though is associated with a lot of benefits, engenders the environment, causes degradation and compounds poverty whenever accident occurs. The increase in the number of petroleum tankers on Nigeria's roads has been traced to corruption that derailed the Nigerian Railway Corporation. Consequently, all heavy trucks and trailers rely on road networks that were not designed and constructed for heavy load. As expected, these roads fall into state of disrepairs as soon as they were constructed or rehabilitated. Invariably, Nigerian roads have become not only death traps but also sources of destruction of flora and fauna whenever accidents of petroleum tankers occur.

The transportation of petroleum/hazardous materials is inevitable. Some of these materials, due to variation in geographical endowment, are available in some areas, while they are conspicuously absent in other areas. Realistically, all geographical units depend on one another, hence the notion of interdependence and socio-economic interactions which require transportation of materials between the various units of a particular region/country.

These materials can be classified into two groups - hazardous and non-hazardous materials. The focus of the paper is, however, on the transportation of hazardous materials (HAZMAT for short). Such materials include: flammable substances (petroleum products, acids and bases), toxic substances (battery, paints, detergents), compressed gases and broken bottles. In the sphere of materials use, transportation of HAZMAT is inevitable. Since transportation is associated with accident, the carriage of the HAZMAT is prone to accident too with the consequence of spilling the HAZMAT. The entrance of HAZMAT into the natural ecosystem engenders environmental degradation which has a strong link with poverty. This has emphasised a question mark on the distribution of petroleum resources in particular in the country because many accidents had occurred in the process of transporting these materials. When accidents occur there is little or no concern for lives of ordinary citizens by Nigerian leaders. Despite the fact that oil minerals constitute the highest source of income for the country the victims of oil accident are more or less ignored.

In order to have an even distribution of petroleum resources in Nigeria, the crude oil is pumped through pipeline from the oil producing region, the Niger Delta to a place like Kaduna to be refined. Reservoirs (depots) are also located in places like Ibadan, Sagamu and Ilorin meaning that refined petroleum are transported through road network to the various consumers. In this respect, the transportation of HAZMAT is associated with high risk on the innocent citizens. Several incident of petroleum-induced fire disaster have claimed several lives and property as in case of Jesse Fire disaster in Ethiope West local government area of Delta State, in 1998, that claimed over 1000 lives and Ile-Ife toll-gate inferno of December 9, 2000 that claimed about 150 lives and property worth million of Naira.

Statistics show that between 2007 and June 2010, a total of 4,017 Tankers/Trailers crashes were recorded on Nigerian roads with a yearly average of 1,148 cases and monthly average of 96 crashes. The rate of crashes involving Tankers and Trailers is on the increase. A total of 4,076 persons were killed in crashes within the same period, while 12,994 persons were injured. A total of 5,825 vehicles were involved in the crashes that generated 17,070 casualties involving 26,362 persons (FRSC, 2010). Considering these trends, the impact of transportation of HAZMAT requires deeper analysis in order to draw out the implications on the citizens, community and environment. The material in this case is

the transportation of petroleum through road network and the accompanied accident and disasters, especially at Ojoo T-Junction, and Inalende junction, Omitowoju area, Mokola Inalende Orita Merin Road, Ibadan of Oyo State, where a total of 8 accidents occurred at the junction involving 14 trailers and a private car claiming a total of 46 lives and several properties.

There is the need for an urgent intervention on the suitable and safe modes of transportation of hazardous materials, especially petroleum products. The required thing is to adopt effective polycentric environmental planning with people-centred decision making that compels kleptocratic capitalist bourgeoisies to comply with environmental standards, respect human lives and property in Nigeria. The intervention requires a new structure of governmentality that will prioritize polycentric planning that can act as a check, under certain circumstance, on the excesses of capitalist bourgeoisies as well as provide greater opportunities for accountable government.

This demands a paradigm shift towards polycentric environmental planning that supports a new institutional arrangement through restructuring whereby the efforts of the stakeholders in the public terrains politicians, bureaucrats, technocrats, scholars, NGOs, youth, FRSC, NURTW, Nigerian Union of Road Transport Owners (NARTO), National Union of Petroleum, Energy and Natural Gas (NUPENG), self-governing and community institutions, etc. are synergized. Polycentric environmental planning relates to good environmental governance which regulates advancing technological development with the quality of the environment and the welfare of the people. It is seen as the overall management of resources for development - with a special emphasis on accountability, the legal framework for development, citizen participation and information dissemination and transparency (see World Bank, 1992; Hilhorst and Bankoff, 2004; Akinola and Adegoke, 2012f).

The paper charts a course of action that can be taken in order to set up machinery for monitoring the operation of HAZMAT transportation. Consequently, an African Polycentric Sustainable Environment Model (APSEM) is adopted to reducing vulnerability arising from HAZMAT accident.

Methodology

This paper is a product of longitudinal studies on transportation of HAZMAT. The methodology adopted in this study included both primary and secondary methods of information collection. Primary data involves personal observation, oral interview and administration of questionnaire to the victims of fire disaster on accident case at Ojoo T-Junction, Akinyele LGA, Ibadan, Oyo State. Both qualitative and quantitative data were collected from the respondents in Ojoo Ibadan while only qualitative data were collected from relevant agencies in the Ibadan. A total of 58 respondents were interviewed with structured questionnaire. They include: 8 landlords, 2 tenants and 48 shop owners. The questions raised covered areas such as conditions of affected houses, nature of business of victims, the cost of renovating the affected properties etc. Relevant agencies were visited and they are: the Local Planning Authority at Akinyele Local Government Council, Oyo State Environmental Protection Agency (OYSEPA) and Ibadan Solid Waste Management (IBSWM) that carried out the clearing of the wastes of the accidents. Secondary data consist of data from the Federal Road Safety Commission (FRSC) sourced from the internet, accident of tanker at Inalende junction, Omitowoju area, Mokola Inalende Orita Merin Road, Ibadan of Oyo State in April 2013 and literature review on the subject matter.

The Problematics of Rentier Economy and Trasportation of Hazmat

Nigerian economy is rentier, characterized by allocation and spending, which condone laziness on the part of leadership and the people. It is discovered that over-dependence on non-renewable resources (fossil fuel) is damaging some renewable resources like water body, fishery and forestry. Oil industry has reduced incentives to develop other sectors agriculture and manufacturing. At the same time, oil industry is not benefitting the people; rather, it is now a source of conflicts and crises.

For instance, Nigeria is the seventh largest producer of oil and gas in the world and the largest in Africa. Oil contributes over 40% to the Nigeria's GDP, about 90% of total annual earnings and about 80% of the national gross income (FGN 2008:212). Nigeria realized an estimated amount of N29.8 Trillion between 1958 and 2007 from oil (Aham 2008:28). In spite of this strategic economic importance, the demographic picture of the country is disturbing. The Human Development Index (HDI) shows deplorable conditions of the Nigeria as low as 0.453. This figure is lower than regions and nations with the same oil and gas resources such as Norway (0.963), United Arab Emirate (0.849), Kuwait (0.844), Libya (0.799) and Saudi Arabia (0.772) (Human Development Index Report 2009). Similarly, the World Bank 2010 World Development Report shows that Nigeria's per capita income is very low: $2,748 (N32,000), falling behind that of Ghana ($10,748), Cameroon ($10,758), USA ($512,612), UK ($408,753) and Sweden ($513,424) (Businessday, Friday, March 26, 2010, p. A1).

The increasing neglect of road development and maintenance coupled with the greed and selfishness of the few capitalists that ate controlling oil industry has increased the rate of accident of tankers. In order to correct this ugly development, the policy makers should be ready to make a commitment to the welfare of the citizenry that are affected in the process of transporting HAZMAT. There is the need to shift emphasis towards adequate compensation on the affected citizens and properties. In Nigeria as in other jurisdictions, the victim who has suffered loss of amenities, expectation of life and future earnings or earning capacity would have a claim in damages for negligence of the "tortfeasor" (Owoade, 1991:186). Applying the concept of criminal restitution, the victims of the impact of transportation of HAZMAT in various communities should, as far as possible, be put back into the position they enjoyed before the offence was committed against them.

Transportation of HAZMAT

HAZMAT is a reflection of modernisation and urbanisation as opposed to primitive societies' conditions. In the primitive age, the available natural resources were greater in quantity than the demand from the respective consumers. Urbanisation with its attendant increase in population requires technological innovations for coping with increasing number of persons that could not be supported by available natural resources. Various industrial processes under technological innovations invariably engender water substances which constitute pollution to the environment and a great risk to health and welfare of man and animals. Apart from wastes, many materials which are inevitable for the survival of modern society also constitute danger to the environment and man.

Materials in this category include: industrial chemical products such as phosphorus, to the full range of petroleum

Human Development Index is a standard measure of well being of people, encompassing the longevity of age, knowledge and decent standard of living in terms of access to safe and clean water, quality health and education services, electricity, road, gainful employment, political participation, rule of law, etc. It is measured with 1 being the highest ranking score6

products; and materials used in modern homes such as paints, ammonia cleaners, and radio-active substances used to produce X-rays and in nuclear technological applications. Flammable substances and compressed gasses top the list of common categories of HAZMAT. The transportation of these materials through any mode constitutes risk and danger in case of accident, hence the need for extra care.

According to the United States Hazardous Materials Transportation Act of 1974, a hazardous material is defined as "a substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property" (Haddow 1987). Such risks posed by the materials could be due to their attributes of ignitability, corrosity, reactivity, toxicity, infectivity and radio activity. The United Nations Environmental Programme, has asserted that there are well over 1000 materials and products that have been classified as hazardous to living things and the environment in general (Sanotsky and Ulanova, 1983).

As economic development advances, large quantities of HAZMAT are transported over or under many industrial and commercial settlements. While the people are aware of the danger of petrol or kerosene tankers, majority of citizens are purely ignorant of buried oil or natural gas pipeline which are also prone to accident. In developed societies, where justice prevails and people know their rights comprehensive approach to planning and monitoring of HAZMAT is usually prioritised. The citizens are given sufficient information about these HAZMAT and risks associated with their transportation are minimised to an acceptable level.

Several countries have developed certain systems which they use to reduce both chance and severity of hazardous materials. Such countries include: USA, Czechoslovakia, Denmark, Germany, Finland, France, Hungary, Netherlands, Romania, Britain, Canada, Bulgaria, Sweden etc. Nonetheless, in establishing and maintaining these systems, certain common problems exist at both the national and international levels. In all these countries, despite the safety measures taken in handling and transporting these materials, disasters resulting from their transportation still occur. However, Kalevela and Radwan (1988) identified two major problems facing the transportation of HAZMAT and they are: inadequately reliable accident data collection systems and inadequate enforcement of regulations imposed to govern the transportation of HAZMAT.

Adeniji (1989) reported that accidents involving the transportation of HAZMAT are not as frequent as in other accidents in the 1980s. The situation at present has, however, changed due to bad roads. Most accidents reported in developed countries are caused by small errors, undetected sources or unforeseen events. This implies that even when reasonable care is taken, there is always a chance that something, probably a small oversight, can result in a major accident. The major dilemma that HAZMAT is associated with in developed societies is that, though the frequency of accident is low, the effect of such accidents is always disastrous and enormous. In Nigeria, however, accidents involving HAZMAT are caused by outright carelessness on the part of owners of tankers, who refuse to maintain their vehicles, drivers who drive under drug influence, etc.

Adeniji (1989) showed that 89% of surveyed firms dealing with transportation of HAZMAT in south-west of Nigeria (Lagos, Ogun and Oyo) had started operation between 1960 and 1980. The materials used for packaging HAZMAT include bottles, metal and plastic containers. Others used cartons, jute bags and wooden crates. The methods and materials used for packaging HAZMAT by the surveyed companies embraced the principle

of risk minimisation and improvement of safety while transporting the materials from place to place. In Nigeria, the road mode accounted for the highest percentage (92.2%), while the remaining figure was shared by other modes (water, air, rail and pipeline). Similarly, in 1985, it was reported in the United States of America that road mode accounted for more than 50% HAZMAT transportation within the country (Kalevela and Radwan, 1988 cited in Adeniji, 1989:14).

Pipelines are used to transport natural gas, petroleum, and other HAZMAT. Though natural gas and petroleum can be very hazardous, studies have shown that pipelines are not as hazardous as rail, water or road transport modes primarily because HAZMAT accidents are extremely rare in developed economy (HMSO, 1972; Mahoney, 1985; Rowe, 1983;). The case of Nigeria at present is highly disturbing as citizens who feel marginalised burst pipeline to siphon petroleum products. Besides, oil equipment and lack of maintenance lead to leakages of oil which on several occasions cause serious inferno and thus predicates deforestation which in turn, induces climate change. It is not enough to construct pipelines; their constant maintenance and monitoring are more important.

Most of the problems we have with the transportation of HAZMAT and environmental degradation is because rules are not obeyed even by the rules makers. Most of tankers owners are those that kill the rail system, involved in dubious contracts that make road impassable and unmotorable; thus, increasing the rate of tanker accidents, destruction of lives and property and ecosystem.

Theoretical underpinning

The theories of collective action suggest that individuals under certain institutional arrangements and shared norms are capable of organizing and sustaining cooperation that advances the common interest of the group in which they belong (Ostrom, 1990). This line of thought recognizes that human beings can organize and govern themselves based on appropriate institutional arrangements and mutual agreements in a community of understanding. This is the fundamental of the Institutional Analysis and Development (IAD) framework. The IAD believes in institutional arrangement designed by people who cooperate based on rules and constitution of their choice, and thereby are able to resolve socio-economic and political problems which other people (external to their conditions) are not capable of doing for them.

The IAD considers the role of evolution, culture, learning and social norms in the discourse on collective action (Ostrom and Walker, 2003). Institutional structures that people have developed over the years avail individuals in the community to make inputs to development in their locality by contributing towards projects (labour, finance and materials) and decision-making in political arenas in rural settings. Since society is a system of human cooperation, people in any society should collectively relate to and deal with their exogenous variables though joint efforts. The joint efforts, however, require certain rules and laws the people use in checking the individuals' excesses and free-riding. These activities of oil industry, especially transportation of HAZMAT are killing Nigerians, causing untold damages to property of citizens and the environment.

The Case Study Tankers Accident and Impact of Hazmat

Route Analysis

The most prone route to tankers/trailers crashes in Nigeria is Lagos

http://www.nationmaster.com/graph/eco_hum_dev_ind-economy-human-development-index (Accessed 25/06/2009).

Ibadan expressway which recorded a total of 296 crashes, that is 7.37% of the crashes between 2007 and June, 2010. Other routes with high crash records are, Kaduna Zaria with 115 crashes (2.86%), Ogbomoso Ilorin with 113 crashes (2.81%), Lokoja-Abuja with 99 crashes (2.46%) and Enugu Otukpo with 90 crashes (2.24%). Uyo Umuahia, Benin Ekpoma and Port-Harcourt Aba recorded 12 cases (0.30%) each the least Tanker/Trailer RTC within the period (FRSC, 2010, Table 7 & Figure 7).

Some Prominent Black Spots (Spot Analysis) of Crashes

Some black spots where these tanker/trailer crashes occurred were also identified and they include 40 RTC at Deeper Life Camp area, along Lagos-Ibadan route. This was closely followed by Tunga-ruwa Sheji village on Mokwa - Jebba road with 36. Next is Ogere with 31, Kofar Dawaki along Kaduna Zaria road with 23 cases, 9th Mile along Otukpo-Enugu raod with 22 , RCCG along Lagos-Ibadan and Mariri along Kaduna Zaria road with 21 cases respectively (FRSC, 2010, Table 8 and Figure 8).

Causes of Crashes Analysis (Nation-wide)

Between 2007 and June 2010, Cumulatively, Dangerous Driving (DGD) accounted for the highest cause of crashes involving tankers and trailers with 1,038 representing 26.41%. Other major causes include Speed Violation (SPV) with 907 cases (23.08 %), Brake Failure (BFL) 359 (9.13%), Tyre Violation (TYV) with 337 (8.58%), Obstructions (OBS) with 306 (7.79 %), and Dangerous Overtaking (DOV) 116 (2.95%). (FRSC, 2010, Table 12 and Figure 12).

Illegal Trailer/Tanker Parks Along Major Routes (Nation Wide)

Illegal Tanker/Trailer parks also constituted black spots and traffic obstructing points. A total of two hundred and fifteen (215) of such parks were identified nationwide. Kano state had the highest with 35 illegal parks representing 16.27%, while Oyo, Kaduna, Osun and Jigawa states had 18 (8.37%), 17 (7.90%), 12 (5.58%) and 11 (5.11%) respectively (FRSC, 2010, Table 13 and Figure 13).

S/N	Year & Season	Cause of accident	Type of materials	Reaction from OYSEPA	Reaction from company	Type & No. of vehicles involved	No. of lives lost	Left-over goods on the spot	The effect of accidents
1	1997 (rainy)	Brake failure	Textile materials and fertiliser	Ordered the company to clear the spot of wastes	Positive	2 trailers	8	Textile materials and fertiliser	Traffic jam; Pollution of nearby river
2	1997	Brake failure	Petroleum products - (Diesel and Petrol)	Ordered the removal of vehicle, while OYSEPA treated the river and send the bill to the company.	Co-operation	6 trailers	24	Diesel and Petrol	Burnt 2 houses, polluted rivers, burnt asphalt and created potholes on the road, and temporarily paralysed business around
3	1997 (dry)	Brake failure	Petrol	The failure of the company to comply made OYSEPA to order IBSWM for clearing the site and the bill sent to the company	Negative	1 trailer tanker	3	Petrol	Burnt asphalt and created potholes on the road. It also pollute the environment with carbon monoxide.
4	1997 (rainy)	Over speeding and brake failure	Rice and Beans	The failure of the company to comply made OYSEPA to order IBSWM for clearing the site and the bill sent to the company	Bad response	1 trailer	1	Rice and Beans	Road blockade. When rain fell, bad odour was produced, road made slippery
5	1998	Poor visibility due to weather	-	OYSEPA ordered IBSWM to remove the bunt vehicles.	-	A private car and a trailer (parked)	2	Burnt private car	Burnt asphalt and created potholes on the road. It also pollute the environment with carbon monoxide
6	1998 (rainy)	Brake failure	Yam	Ordered the company to clear the spot of wastes	There is no response from the company.	1 trailer	4	Yam	Road littered with yam.
7	1998 (dry)	Over speeding and brake failure		-	Removed the vehicle immediately	Empty tanker	-	-	-
8	Oct., 1998 (rainy)	Brake failure	Petrol	Treated the affected wells	The company abandoned the vehicle	1 trailer	4	Petrol	Several properties burnt
TOTAL						14 trailers and 1 car	46		

OYSEPA = State Environmental Protection Agency
IBSWM = Ibadan Solid Waste Management

Accident Cases at Ibadan

This section focuses on accident cases at Ojoo T-Junction, Akinyele LGA, Ibadan, Oyo State (Table 1).

Table 1 shows that the cause of the majority of the accidents on the spot was attributed to brake failure. The slope and sharpness of the corner, no doubt, contributed in no small measure to the accidents. Within a year, a total of 8 accidents occurred involving 14 trailers and a private car claiming 46 lives. Besides, the accidents have engendered a lot of ecological disasters in the nearby streams and rivers. Generally, HAZMAT that are spilled on the ground during accidents in Nigeria are not usually removed immediately, hence the materials must have exerted impact on the environment and consequently on the health of people. In order to draw out vividly the implications of HAZMAT, on societal welfare and environment an in-depth study of the accident that occurred at the junction was carried out. On 27th October, 1998, a trailer (tanker) carrying petroleum product had an accident on the concerned spot (Ojoo T-junction). It is salient at this juncture to identify some features of the accident spot and they include:

1. The topography of the area is sloppy; The area is associated with high commercial activities;
2. Trailers are usually parked on both sides of the road (the perpendicular axis of the T-junction;
3. Pumps are erected on the road to reduce the speed of vehicles; and
4. The droplets of diesel oil and engine oil resulting from parked trailers make the road to be slippery.

The gravitational force that is generated by the slope coupled with the slippery nature of the road and the sharp corner (more or less at right angle) is causative factors for most accidents that had occurred at the junction. The immediate cause of the October, 1998 accident was traced to brake failure. It then became difficult for the driver to manoeuvre the vehicle. Consequently, the vehicle entered into drainage beside the road and in the process the tanker containing petrol got detached from the main engine and fell down. The driver, on realising what had happened, drove the engine to Moniya Police Station at Akinyele Local Government to report the case.

The trouble started when the lids of the tanker opened; petrol gushed out and flew in different directions. Quite substantial quantity of the hazardous liquid flew down the drain for about 800 metres where a woman was preparing food with naked fire. The resultant inferno was terrific and disastrous. It was gathered that both the police and fire brigade came late to the spot of fire disaster, hence, there was nothing for them to salvage.

The impact of inferno was manifested on both lives and properties as contained in Table 2. A family lost three of their four children to the fire disaster, while another family was bereaved of a daughter who had married with one kid. A six-flat building which was used for offices and shops was razed down with all the properties inside. Other properties affected are displayed in Table 2. On the whole, 58 properties owners were affected and the breakdown of the figure shows that there are 8 landlords, 2 tenants and 48 shop owners. The State Government paid the affected people some token amount of compensation of N2.5 million to be shared by 58 people.

Information gathered revealed that N1.7 million was shared among the eight landlords (see Table 2) according to the type and quality of their buildings, and the two tenants were given N200,000.00. According to the information collected from the leader of the properties owners, accurate figure could

not be given for the remaining victims. However, it was gathered that the shop owners were grouped into three categories (high, middle and low business ventures) depending on the nature and volume of business. There are 10 shop owners who fall into the high category and each of them was paid about N34,000.00, while 20 owners happened to be in the middle bracket and each of them was given about N10,000.00. The remaining owners who belonged to the low category were paid about N5,000.00 each.

Table 2: Information on the cost of renovation of the affected properties and compensation (in Naira)

S/N	House type	Cost of renovation	Compensation	The worth of compensation (%)	Balance (+ or -)	Remarks
1	6-Flat building	500,000.00	271,000.00	54.2	-229,000.00	-
2	7-Rooms bungalow	430,000.00	200,000.00	46.5	-230,000.00	-
3	4-Rooms bungalow	300,000.00	170,000.00	56.6	-130,000.00	-
4	16-Rooms (2 storey buildings)	450,000.00	250,000.00	55.5	-200,000.00	-
5	One multipurpose shop	50,000.00	171,000.00	342.0	+121,000.00	3 children died
6	8-Rooms bungalow	450,000.00	220,000.00	48.8	-230,000.00	-
7	6-Rooms bungalow	390,000.00	200,000.00	51.3	-190,000.00	-
8	7-Rooms bungalow	400,000.00	218,000.00	54.5	-182,000.00	-
Total		2,970,000.00	1,700,000.00			

Table 2 shows that all but one property owners were worst off due to the impact of the accident. Except a family that was bereaved of three out of four children, none of the property owners received compensation up to 60% of the cost of renovating the affected properties. It was difficult to get the actual value of the affected properties; hence, the actual cost of renovation was used instead. In any case, all the affected people were subjected to poverty one way or the other. Moreover, it took about four months before the compensation actually materialised. Many people were forced to sharing of apartments with other people within the community indicating high occupancy ratio in housing, a condition which breeds social and psychological stresses. Businesses were paralysed and life became unbearable with the affected families. All these symptoms, no doubt, indicate poverty among the affected people.

It was also gathered that the sources of drinking water, especially, wells that were located within a distance of about 1.5 kilometres were contaminated by petrol. People could smell petrol in their water. Resource contamination is also an indication of poverty in the sense that the contaminants directly or indirectly find their ways into human beings, thus causing various types of sickness and diseases. Information from OYSEPA showed that all the affected wells were treated with chemicals and the people were asked to refrain from sourcing water from the wells for a period of one week. This also introduces another dimension of poverty because the community dwellers were forced to purchase water for the period of abstinence from the well water. This is a challenge to the municipal managers for networking the city with pipe-born water.

Analysis of age structure of the respondents shows that the majority (55.2%) of the affected people were above 40 years old as shown in Table 3.

Table 3: Age structure of the respondents at Ojoo, Ibadan

Age in years		Landlords	Tenants	Shop owners	Total	Percentage
1	20 . 29	-	-	5	5	8.6
2	30 -39	-	1	20	21	36.2
3	40 – 49	3	1	13	17	29.3
4	50 & above	5	-	10	15	25.9
		8	2	48	58	100.0

Still in Table 3, the majority (62.5%) of the landlords were above 50 years of age. The circumstances the victims found themselves suggested hardship and if governance

apparatus of the society fail to reflect welfare intention, these people are perpetually plunged into poverty ridden condition. It is true that the people were fairly compensated for renovation; other properties they lost in the disaster could not be regained. This calls for a re-visit of the issue by the federal government in particular.

The impact of the accident on the occupation of the respondents is demonstrated in Table 4.

Table 4: The impact of the accident on the occupation of the respondents

S/N	Occupation	Before the accident	After the accident	Impact of the accident (%)
1	Farming	3	3	-
2	Contract	2	2	-
3	Business	25	10	15 (60.0)
4	Pool agent	3	1	2 (66.7)
5	Shoe making	2	-	2 (100.0)
6	Civil service	2	2	-
7	Food selling	6	2	4 (66.7)
8	Petty trading	15	5	10 (66.7)
Total		58	25	33 (56.9)

Table 4 portraits that 33 persons (56.9%) lost their jobs due to the accident of vehicle carrying HAZMAT. The groups who were hardest hit include: business men and women, (60.0%); pool agents, (66.7%); food sellers (66.7%); petty traders, (66.7%); and shoe makers, (100.0%). The effect of the disaster on the occupation of the people invariably affects their income. Using income to measure the impact of the accident on the people, it was found that 90.0% the people within the high income group were affected, while the figure for the middle income bracket was about 62%. This means that less number of people who retained their jobs after the accident was found within the high income group and the same goes for middle income people. The number of low income people increased by about 19.0%. This implies that the majority of the victims directly or indirectly have been plunged into poverty as far as their income is concerned.

The April 2013 Tanker Accident in Ibadan and Other Cases

In April, 2013, a petrol tanker at Omitowoju area of Ibadan tumbled at the junction of the road leading to Mokola Inalende Orita Merin Road. The tanker exploded into fire and burnt over 60 houses (Olaitan, 2013). A tanker from Lagos to Ibadan, in an attempt to avoid a pothole tipped on its side and spilled its fuel content on the road, which caught fire and burnt six vehicles with most of their 90 passengers. Similarly, about 36 people were killed in a major road accident when a petrol tanker collided with a bus and a lorry on the Benin-Ore highway at Igbogui village in Edo state. The tanker exploded after the collision and killed the passengers. In July 2012, more than 100 people who rushed to collect fuel after a petrol tanker tipped over in southern Rivers state were burned to death when the vehicle and pools of spilled oil caught fire.

Mitigating Hazmat Accident through Polycentric Environmental Planning

There is the need for an urgent intervention on the suitable and safe modes of transportation of HAZMAT, especially petroleum products. The required thing is to adopt effective polycentric environmental planning with people-centred decision making that compels kleptocratic capitalist bourgeoisies to comply with environmental standards, respect human lives and property in Nigeria. The intervention requires a new structure of governmentality that will prioritize polycentric environmental planning that can act as a check, under certain

http://www.guardiannewsngr.com/news/article02/301007

Petrol Tanker Explodes in Nigeria Killing 36 - Friday, 05 April 2013 20:36. Http://www.elombah.com/index.php/latest-news/15355-petrol-tanker-explodes-in-nigeria-killing-36

circumstance, on the excesses of capitalist bourgeoisies as well as provide greater opportunities for accountable government.

This demands a paradigm shift towards a new institutional arrangement through restructuring whereby the efforts of the stakeholders in the public terrains politicians, bureaucrats, technocrats, scholars, NGOs, youth, FRSC, NURTW, NARTO, NUPENG, self-governing and community institutions, etc. are synergized. Polycentric environmental planning relates to good environmental governance which regulates advancing technological development with the quality of the environment and the welfare of the people. It is seen as the overall management of resources for development - with a special emphasis on accountability, the legal framework for development, citizen participation and information dissemination and transparency (see World Bank, 1992; Hilhorst and Bankoff, 2004; Akinola and Adegoke, 2012f).

Analysis and modeling appropriate to the vision via new institutional arrangements for implementation are also very crucial for reduction of tankers accident. The new institutional mechanism will enable Federal and State Governments to reposition the operation of tankers' operators to deliver inclusive environmental policies and strategies as well as effective transportation of HAZMAT. Since society is a system of human cooperation, stakeholders in transportation of HAZMAT should collectively relate to and deal with their exogenous variables in order to reduce, if not eliminate tankers accident. Exogenous variables are those conditions that affect human livelihoods and which humans have to work upon through appropriate planning and institutional arrangements to better their conditions of existence. However, there are some fundamental imperatives of collective action within environmental arena. These are collegiality, mutual trust, reciprocity and shared understanding. It is the realization of these imperatives through constitutional reforms, effective planning and institutional arrangements that can enable stakeholders in transportation of HAZMAT to work together to achieve accident free transportation of HAZMAT.

This direction of rethinking for environmentalism towards transportation of HAZMAT should be patterned after deliberative democracy, which is considered more appropriate for Nigeria (Akinola 2010a, 2011a). For example, one of the proud inheritances of South Africa's democracy is public dialogue in the form of community forums, negotiations, and imbizo. Community forums have been part of social movements in the fight against both apartheid and post-apartheid inequalities. Negotiations proudly characterized the transition to democracy which is based on principles of nondiscrimination (Hartslief 2005:1). The equivalent of imbizo among the Yoruba of Western Nigeria is igbimo ilu (town court of legislators), Mai-angwa among the Hausa-Fulani of Northern Nigeria, opuwari among the Ijaw in Bayelsa State, mbogho among the Efik and Ibiobio of Cross River and Akwa Ibom States, and boonator among the Ogoni in the Niger Delta of Nigeria. It is high time Nigerians looked back in retrospect to learn from their roots by harnessing certain self-governing principles that are inherent in their cultural heritage to address HAZMAT challenges.

If we agree that institutions matter in terms of

Imbizo is a word from the Zulu language in South Africa. It means a "gathering" for the purpose of discussing important matters within a group or community. Its ultimate purpose is to ensure participation of members in the process of conceptualising, making and executing decisions. The imbizo, in its traditional form, has constituted an important aspect of the indigenous African political system for many centuries, especially in Southern Africa (Hartslief, 2005:1).

their influence on cooperation, then self-organizing and self-governing arrangements that local people have adopted in cooperating mutually in responding to their common problems are imperatives as a condition to be met for reduction of HAZMAT accident challenges and environmentalism. Recent indications support the fact that the peoples of Nigeria through self-organizing and self-governing arrangements have been responding appropriately to the needs and aspirations of the citizenry. By exploring pre-colonial governance heritage and practices elsewhere, the people have been able to respond to social challenges that the state has effectively dodged over the years (see Akinola, 2000, 2005d, 2007a,f, 2008b, 2009a,b, 2010a,i, 2011a,b,d, 2012a,b). Considering the good performance of the local people through self-governing institutions across Nigeria, local people are capable of cooperating with governments (federal, state and local) in designing people-oriented environmentalism that will reduce vulnerability arising from HAZMAT accident.

It is this type of self-governing and self-organising local arrangement that can be integrated into the formal system of government at the local level in Nigeria. This, invariably, will lead to effective cooperation and deliberation between and among public officials, scholars, industrialists and citizens at community level, thereby eliminating gaps between the four groups. Following this is the adoption of African Polycentric Sustainable Environment Model (APSEM) to reduce vulnerability arising from HAZMAT accident.

African Polycentric Sustainable Environment Model (APSEM)

African Polycentric Sustainable Environment Model (APSEM) is designed for conserving and protecting environmental resources (Akinola 2009b:96, 2008q:66-67) (Fig. 1). APSEM is adopted for reducing vulnerability in HAZMAT transportation and accident. The model derives inspirations and working mechanisms from two models and they are: (i) African Public Sphere Restructuring Model (APSRM) (Akinola 2010a, 2011a); and (ii) African Polycentric Information Networking (APIN) (Akinola 2009b:94, 2011e:67). As shown in the first part of Fig. 1, free riding on the part of oil sector is a major factor that is engendering death, loss of property through HAZMAT transportation across communities. Consequently, degreening, forest depletion, erosion, air and water pollution, environmental poverty, diseases, death, etc. become the order of the day.

The second part of the model, as shown in Fig. 1, attempts at synergizing the efforts of stakeholders/participants (government, oil industry, scholars, FRSC, NGOs, NURTW, NURTW, NARTO, NUPENG and self-governing institutions) within environmental arena. By adopting the African Public Sphere Restructuring Model (APSRM) and the African Polycentric Information Networking (APIN), the restructuring process will commence (first step in restructuring process) with the design of polycentric sustainable environmental mechanism (PSEM) by scholars and public officials, and the setting up of self-governing community environmental assembly (SGCEA) where stakeholders through their institutions can operate in synergy.

African public sphere restructuring model

African Public Sphere Restructuring Model (APSRM) is conceptualized as a deliberate act of setting up self-governing community assembly (SGCA) for deliberation, collegiality, mutual trust, reciprocity and shared community of understanding (2010a:73-78, 2011a:40-47, 2011e:66). The model contends that, since political factor determines the operation of other sectors of

economy, the starting point is to commence with the application of strategies that can restructure the public sphere so that socio-economic and environmental crisis accompanying HAZMAT accident in can be addressed. The model addresses reconstruction and reconfiguration of the public sphere to synergize the efforts of the people through their institutions, governments, oil sector, FRSC, NGOs, NURTW, NARTO, NUPENG to resolve the lingering HAZMAT accident challenges, socio-economic crises and poverty. At the same time, it charts a course of action on how citizens at community level can be mainstreamed in decision making, rule-monitoring and enforcement of sanction on rule infraction. APSRM emphasises two elements deliberation and deliberateness/action (Akinola, 2010a:73-78, 2011a:40-47, 2011e:66).

African Polycentric Information Networking (APIN)

The application of APIN would strengthen linkages and interactions between individuals and self-governing institutions. This would help in addressing the problem of information asymmetry, which is a major factor that strengthens "prisoner's dilemma" and "tragedy of the commons. The beauty of polycentricity is in its multifarious connections and interactive links that all members of a particular community have to receive information, interact and make contributions to decision-making and conflict resolution. For example, decision taken or information passed in a polycentric system has the possibility of reaching every member of a community through, at least, four of eight channels. The linkages and interactions can be connected to the state structure of governance for information dissemination from state to local/community levels (see Akinola 2009b:94, 2011e:67).

Self-governing institutions (SGIs) are institutions crafted by the people, without external interference, in an attempt to solve their common problems within their locality or community. They are also called people-oriented, people-centered or community-based institutions (see V. Ostrom 1994, 1997, 2000; E. Ostrom 1990, 1999; E. Ostrom, J. Walker, and R. Gardner 1992; E. Ostrom and V. Ostrom 2003; Wunsch and Olowu 1995; Mc Ginnis 1999a; Ayo 2002; Olowu, 1999, 2006; Olowu and Wunsch 2004; Gellar 2005; Sawyer 2005; Akinola 2005d, 2008b, 2009a,b, 2010a,i, 2011a).

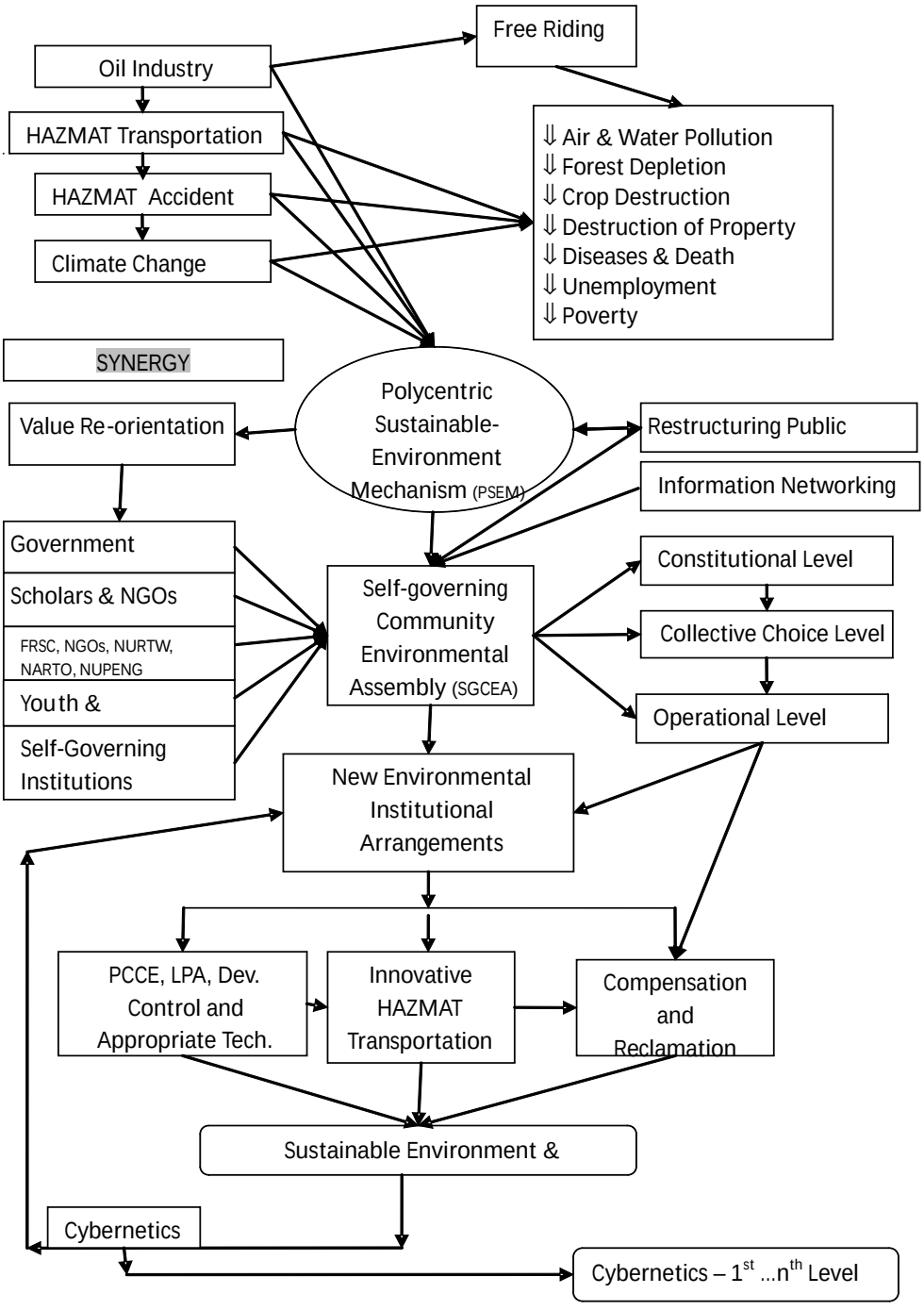

Fig. 2: African Polycentric Sustainable Environment Model (APSEM)
Source: Adopted from Akinola (2009b:96; 2011e:62,68)

Self-Governing Community Environmental Assembly (SGCEA), Civic Enlightenment and Citizens' Responsibilities / Tasks

The SGCEA should be patterned after imbizo, igbimo ilu, opuwari and mbogho but modified to include representatives of governments with their agencies, higher institutions, community institutions, occupational groups, women groups, youth, FRSC, NGOs, NURTW, NARTO, NUPENG etc.). Since SGCEA is a multi-tasks assembly, one of its operations will have to do with education and enlightenment of citizens so that public officials and the people operate within shared communities of understanding. When citizens are able to realize that they can and should take full responsibilities in shaping and re-shaping their environment to suit their daily aspirations and yearnings through active and constructive interjections, then shared communities of understanding would be established.

It should be pointed out that environmental management is best coordinated at local level. Hence, environmental management programmes should be decentralized to local governments. The type of LG system that can deliver results to the citizenry should be self-governing and structured polycentrically. In a polycentric system, all interests and occupational groups that exist within the local government area should be recognized, while leaders of these groups should be part of SGCEA. The first task before the assembly is to share views and values of all the groups / interests. Among the issues to be discussed are: the importance of environmental resources such as HAZMAT to all the interest groups; the implications of transportation of HAZMAT and accident; environmental degradation, etc. for effective environmental management.

Two major tools of SGCEA are Public Complaints Commission for Environment (PCCE) and Environmental Cost Internalization (ECI). There is the need for the establishment of Public Complaints Commission for the Environment (PCCE), independent of the Federal Ministry of Environment at the federal, state and local government levels. The PCCE will be a monitoring body that should comprise representatives from Federal Ministry of Environment, Town Planning Registration Council (TOPREC), Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON), Council of Registered Engineers of Nigeria (COREN), environmental related Non-governmental Organisations (NGO) and community institutions. The PCCE at all levels of government are to monitor the activities of NURTW, NARTO, NUPENG for a clean, safe and healthy environment and prosecute non-compliance. The monitoring group is crucial at this critical time because monitoring and enforcement of environmental standards have been identified by the World Bank as major problems confronting the realization of a clean, safe and healthy environment.

These tools will ensure stakeholders to jointly take decisions, monitor HAZMAT and ensure that all industries comply with safety regulation and standards. It is also suggested that "the polluters pay legislation" should be enforced and adequate compensation be paid to victims at the appropriate time. Whenever accident of HAZMAT occurs, the Commission at the Local Government level in which the accident occurs will switch into operation. In order to serve as deterrence, as in aviation industry, victims or relations of HAZMAT victims should be supported by the FRSC and the Legal Aid Council and other relevant authorities to initiate civil cases against the culprits and get compensation. They should also ensure that adequate fines are received from the HAZMAT industry to be used for reclamation of derelict land and to provide health facilities and job opportunities for the

affected communities. In implementation of this strategy, it is necessary to survey accident premises so as to:
Show the type of pollution being released by the tanker.

Ascertain the causes of accident.
Convince and compel the industrialists of the need to pay for environmental hazards that their operations have engendered.

Guide the decision makers on how to reclaim derelict land and to package and locate health facilities for the affected citizens within the accident premises.
The second step in the restructuring process is a value re-orientation among stakeholders. The technical environment should provide the tools and knowledge, which define how impact of HAZMAT accident should be calculated. The institutional environment should define who pays for damages.

Third, the participants would operate using rules that are crafted by members at the SGCEA. Rule crafting takes place at three levels constitutional, collective choice and operational. At the constitutional level lies the system that determines how rules are made and can be modified. At the heart of effective environmentalism is the imperativeness of constitutional reform which can be accomplished through pragmatic experience. The adoption of polycentric environmental strategy could avail the citizens the opportunities to dialogue in community assembly and jointly take decisions on compensation and land reclamation. At the collective choice level, rules that define and constrain the actions of companies, groups, individuals and citizens in HAZMAT accident matters have to be established. At the operational level, concrete actions have to be undertaken by those individuals most directly affected (oil industry, NURTW, NARTO, NUPENG, community members, property owners, farmers, etc.).

Fourth, the outcome of the restructuring is emergence of new environmental institutional arrangements, which would reflect integrative constitutional order in environmentalism and HAZMAT transportation. It is this joint action and synergy by these groups that would eventually determine how government policies on HAZMAT transportation, accident of tanker, compensation, aforestation, etc. are to be implemented. After the institutional arrangement has been designed, operational strategy for implementation of HAZMAT matters would be fashioned out.

Summary of findings
Transportation of HAZMAT has generated untold damages on lives and properties of innocent citizens as a total of 4,076 persons were killed in crashes between 2007 and June 2010, while 12,994 persons were injured. Even though the affected people in Ibadan were compensated, generally all the property owners were worst off. None of the property owners received compensation up to 60% of the cost of renovating the affected properties. In fact, it took about four months before the compensation actually materialised. Many people were forced to sharing of apartments with other people within the community indicating high occupancy ratio in housing, a condition which breeds social and psychological stresses. Businesses were paralysed and life became unbearable with the affected families. All these symptoms, no doubt, indicate poverty among the affected people.

About 57% of the respondents lost their jobs due to the fire disaster. The effect of the disaster on the occupation of the people invariably affects their income. It was found that 90.0% the people within the high income group were affected, while the figure for the middle income bracket was about 62%. This implies that the majority of the victims directly

or indirectly have been plunged into poverty as far as their income is concerned. It was also evident that the magnitude of environmental degradation on the natural ecosystem was high as wells were contaminated and the people were forced to purchase water for the period of abstinence from the well water.

Policy implications

In view of the fact that some of the causes tanker accidents could be traceable to the bad road conditions, the FRSC should not only be arresting motorists but also be mounting pressure on the governments and the relevant agencies to improve on the road conditions. Emphasis should also be placed on vehicle conditions, especially as they concern brake system and tyre condition. There should also be provision of tanker parks and rest areas along the route, where drivers can rest at specific interval on the journey. Route associations of the drivers and owners such as, the Nigerian Union of Road Transport Owners (NARTO) and National Union of Petroleum, Energy and Natural Gas (NUPENG), among others, should be involved in decision making on policy on safe road culture.

In addition to improving the conditions of the road, the Federal Government should adopt the concept of intermodal coordination by resuscitating the ailing rail transport system and also improve on water and pipeline transport modes through improved governance. This will reduce the pressure on the road, which presently accounts for about 90% of the total movements in Nigeria (see for example, FRSC, 2010).

In order to serve as deterrence, as in aviation industry, victims or relations of crash victims should be encouraged and supported by the FRSC and the Legal Aid Council and other relevant authorities to initiate civil cases against the culprits and get compensation. Vehicle maintenance, maturity of drivers in age and experience should be considered imperatives. A situation whereby young people are preferred by operators to elderly persons because of higher rate of turn-over should be discouraged with punitive measures.

Conclusion

The transportation of HAMZAT on roads has generated untold damages on lives and properties of innocent citizens as a total of 4,076 persons were killed in crashes between 2007 and June 2010, while 12,994 persons were injured. Even though the affected people in Ibadan were compensated, generally all the property owners were worst off. None of the property owners received compensation up to 60% of the cost of renovating the affected properties. In fact, it took about four months before the compensation actually materialised. Businesses were paralysed and life became unbearable with the affected families. It was found that 90.0% the people within the high income group were affected, while the figure for the middle income bracket was about 62%. This implies that the majority of the victims directly or indirectly have been plunged into poverty as far as their income is concerned. It was also evident that the magnitude of environmental degradation on the natural ecosystem was high as wells were contaminated and the people were forced to purchase water for the period of abstinence from the well water.

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There is the need for an urgent intervention on the suitable and safe modes of transportation of hazardous materials, especially petroleum products. The required thing is to adopt effective polycentric environmental planning with people-centred decision making that compels kleptocratic capitalist bourgeoisies to comply with environmental standards, respect human lives and property in Nigeria. The intervention requires a new structure of governmentality that will prioritize polycentric environmental planning that can act as a check, under certain circumstance, on the excesses of capitalist bourgeoisies as well as provide greater opportunities for accountable government. The paper, therefore, charts a course of action that can be taken in order to set up machinery for monitoring the operation of HAZMAT transportation. Consequently, an African Polycentric Sustainable Environment Model (APSEM) is adopted to reducing vulnerability arising from HAZMAT accident.

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