

# LIJOMASS

LAPAI INTERNATIONAL JOURNAL OF MANAGEMENT  
AND SOCIAL SCIENCES

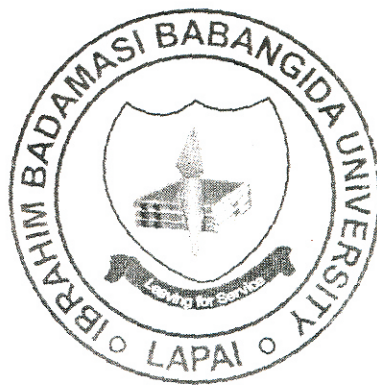


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## **AN ASSESSMENT OF ENVIRONMENTAL AND FINANCIAL ACCOUNTING ISSUES IN THE OPERATION OF OIL AND GAS INDUSTRY IN NIGERIA**

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### **ABSTRACT**

*This study is an assessment of vital environmental accounting parameters such as the degree of environmental degradation, depletion pollution among others which influence economic development and management of the environment where oil and gas industries operate in Nigeria was undertaken with a view to determining the economic losses incurred by the country through environmental degradation occasioned by oil spillage, pollution, as flaring, damage to the ecosystem and recommend appropriate strategies that would enhance best management practices in the industry. Stratified random sampling was used to select the sample. Data from primary and secondary sources were collected and analysed with descriptive and inferential statistics such as percentage, mean response, Freidman's analytical technique and regression analysis technique. The study revealed that the impact of each environmental accounting parameter on the environment where the firms operate was very low and unfavourable. Consequently, the study advocated for a change in strategies currently in use by the firms. Finally, the need for a more detailed disclosure on cost as externality charges by the firms in their annual reports was suggested for a better accounting practice. Also management of environmental hazards in the future was proffered if the much desired development in the oil producing area must be achieved.*

**Keywords:** Environmental hazards, environmental accounting, environmental degradation, environmental impact assessment

## INTRODUCTION

Developing countries are usually faced with various challenges of desertification, deforestation, pollution and poverty associated with environment degradation (Schramm and Warford, 1994; Fakiyesi 2006; Owolabi, 2006). Recently, environment issues are being addressed in Nigeria unlike in western countries where a lot of awareness had been created on environmental induced problems.

High degradation of the environment health hazards, pollution and so on are making people to be increasingly agitated and to show concern about happenings in the environment. Thus, Yakhou and Dorweiler (2004:12) posited that "with increasing social focus on the environment, accounting fills an expectation role, to measure environmental performance". This assertion was corroborated by Dolomite and Touché (1993), when they averred that environmental accounting is important for internal information purposes in order to meet the recent growing demand by company stakeholders on the need to produce environmental reports.

A cyclical cause and effect relationships exist between economic development and environmental issues (Owolabi, 2000). Poverty and population pressure compel people to deplete natural resources in their environment. Two-thirds of Nigerians are poor (NEEDS, 2004). Poverty contributes to environmental problems especially in the development world where people's economy is mainly agrarian. Large hectares of farm lands have to be destroyed through bush clearing and burning. Fire woods are also fetched for daily cooking. All these affect the flora and fauna. With a teeming population of about one hundred and forty million people, going by the 2006 census result, Nigerians are bound to put much pressure on their environment for survival. Even a population annual growth rate of 2.8 percent is enough to provoke economic and social problems of substantial magnitude (Olorunfemi, 2006). It has also been noted that high population growth rates without a corresponding industrial development plan often leads to degradation and wanton destruction of environmental and natural resources.

Besides, the current issues in academic discourse are that environmental issues ought to be reflected in both management and financial accounting systems (Owolabi, 2006). Secondly, that assessed or allocated cost more often than not usually results in sub-optimization, International Institute for Industrial Environment economic, 1996). The above two positions were further strengthened by Ditz, et al (1995), who averred that incorrect allocation and intermingling of environmental costs and benefits with other issues in

the accounting reports usually cause sub-optimal managerial performance.

These contending issues have raised the following pertinent posers namely: What are the environmental and financial accounting issues that should be.

To what extent does the nation suffer economic losses owing to environmental degradation caused by the activities of the oil and gas industry? How adequate are the laws governing the operations of the oil and gas industry in Nigeria? What are the strategies that should be put in place to enhance the management of the above mentioned accounting issues in the oil and gas industry? In order to provide answers to the above questions, the following objectives were pursued:

To identify the financial and environmental accounting issues that are associated with the activities of the oil producing industries in Nigeria; to evaluate these financial and environmental accounting issues; to determine the economic losses to the nation from the environmental hazards caused by the activities of the oil firms; to examine the adequacy of the existing legal structure that govern oil exploration in Nigeria; and to examine the graft strategies that would enhance the overall management of the oil and gas industries in dealing with further environmental hazards.

## LITERATURE REVIEW

Environmental accounting requires multidisciplinary knowledge in behavioral science, engineering, sociology and even biology. This perhaps explains why IIIIEE (1996) posited that environmental accounting is not yet sufficiently explored. Dorweiler (2004) is of the view that environmental accounting has indeed proceeded through a period of uncertain status, hence its frame work is yet to develop.

Ramanathan (1976), quoted in Owolabi (2006) looked at environmental accounting from the premise of social contract theory and anchored his argument on the basis of external diseconomies where it was expected that environmental accounting framework should provide standards for reporting and standards for accounting.

Several decades ago, environmental accounting or issues were not considered a matter of utmost importance by both organizations and individuals. Things have changed as developed and developing countries have now recognized the benefits of caring for the environment. Jaggi and Zhao (1996) noted that the increase in pollution level coupled with a corresponding increase in natural environment degradation; drastic changes in climatic conditions due to

global warming and ozone layer depletion have since made the general public to become conscious of environmental matters. Today issues relating to the environment now take the center stage in any political and socioeconomic discourse. A good accounting system that indicates economic performance must reflect sustainable income. According to El Serafy (1995), unsustainable incoming is wrongly estimated.

In computing the national income accounts, accountants ignored the role of nature in the productive process when the nation's population was not as large as it is now and economic activities were also at their low ebb. Then, environmental services were treated as free goods; hence, no value was attached to the intrinsic cost of the natural resources being exploited. Harmful emissions released by individuals, households, firms and governments, with their attendant high economic loss by way of medical bills, increased morbidity and mortality, loss of beautiful natural environments were often ignored in the national accounts (El Serafy, 1995; Fakiyesi, 2006).

The national accounts often provide inflated estimates of income or reduced national product when full effect of pollution is not properly accounted for as a cost of production. The costs associate with depletion and degradation of natural capital ought to be integrated into the national income accounts.

Valuation of environmental functions and aesthetic aspects of nature in money terms has equally proved difficult. Also, accounting for pollution in the national accounts has not been easy either. This is because environmentalists and economists view environment differently. The former view it as wealth counted in physical units, hence, they regard the balance sheet as the primary instrument for environmental accounting where changes in the environment from year to year in terms of cost are reported, while the latter value capital stock as the discounted value of all future goods and services that the capital is capable of producing. To the economists, natural capital cannot be accurately measured and can never be comprehensively valued (El Serafy, 1995).

The user approach has been advocated for natural resource accounting in spite of the inherent drawback that this method heavily relies on many estimated and uncertain measurements. El Serafy (1981, 1989) advocated that the user cost can be computed in relative terms as a proportion of sales value using life expectancy of the resource at current extraction rates, expected yield rates, or interest which may be earned from re-investing the user costs in new capital formation so that income can be perpetuated. The objective is to have sustainable income

even after total resource depletion, with new investments being either financial or material.

IIIEE (1996) opined that accounting for sustainability is still a long way off. However, the first step[ towards sustainability reporting requires accounting for through-flow of renewable and non-renewable resources. Therefore, sustainable development requires a balanced economic prosperity, environmental management and social responsibility. Owolabi (2006) advocated a linkage of satellite accounts with system of national accounts where adjustments can be made. This is to enable computation of sustainable Gross Domestic Product (GDP) and Net Domestic Product (NDP) in satellite accounts.

The general consensus therefore revolves round the notion that it is imperative for the oil and gas industry to always disclose, quantify and monetize all their activities in the form of assets and liabilities, not only to themselves, but also to the society in general, in their annual reports. The need to attach cost to all activities ranging from searching for oil, to extraction, pollution, depletion and degradation of environment was stressed.

For over four decades now, the Niger Delta Region of Nigeria has been subjected to series of harrowing experiences sequel to the activities of oil producing companies. Their environment has been degraded owing to crude oil exploration and exploitation. Some of the effects of oil exploration include incessant, oil spillages either due to pipeline vandalization or industrial accidents, constant gas flaring, air and water pollution, destruction of the vegetation and rural-urban drift (Ogbeifun, 2007). Costal erosion has reduced arable land for agriculture; acid rain caused by gas flaring and oil spillage has caused death of aquatic life leading to reduction of commercial fishery activities.

The cumulative loss from oil spillage was estimated at 2,300 cubic meters of oil in 300 separate incidents annually (Moffat and Liden, 1995). The statistics of the Department of Petroleum Resources (DPR) showed that between 1976 and 1995, 4835 incidents of oil spillage resulted in at least, 2,446,322 barrels of which about 1,896,930 barrels were lost to the environment. In 1980, 200,000 barrels of oil spilled into the Atlantic Ocean from Texaco facility destroying 340 hectares of mangroves (Oil Spill Intelligence Report, 1998). Komolafe (2007) reported that Nigeria has been losing 600,000 barrels of crude oil daily due to oil spillage. Besides, several human lives equally been lost. In monetary terms, the country lost N10.121 billion in 2000, and N42.102 billion in 2005 through oil spillage (Ogbeifun, 2007).

The controversy on the most appropriate methods of computation and inadequate disclosure of environmental externalities by the oil and gas industry has generated a lot of debate in recent times. Environmentalists and researchers have at various times provided or suggested different methods of quantifying by a way of cost, environmental externalities. Owolabi (2006) advocated that the two main approaches currently being used in the energy industry for quantifying and monetizing externalities are the:

- Cost of control approach, and
- Damage function approach.

The cost of control approach deals with installation and operational environmental control costs, which are usually proxied for the naira value of actual damages. The damage function approach uses site-specific data and modeling techniques that are usually combined with econometric methods to estimate external impact and costs.

However, the management of oil and gas industry seems to have been at crossroads in arriving at a most suitable and less controversial model of determining externality charges. Up till 2009 an acceptable framework that would identify, analyzed and quantify the minor and major causes of environmental problems in monetary terms is yet to be developed. Modern technology management tools that dwell in continuous improvement of quality as a process could be applied to handle various causes (minor and major) of environmental problems. A comprehensive identification and knowledge of the causes of environmental issue may further help quantify the various environmental costs. One of such model is the cause and effect diagram (fishbone-diagram) proposed by (Ishikawa, 1993). In doing this, however, it may not be out of place to consider some of the key strategies that were put to use by the management of the oil and gas industry themselves.

## METHODOLOGY

The units of analysis were some upstream oil companies such as Shell and Mobil (Producing). Others whose activities were examined include the Nigeria Petroleum Corporation (NNPC), Federal Ministry of environmental Protection Agency (FEPA), Niger Delta Development Corporation (NDDC), Nigeria Accounting Standard Board (NASB) and some Environmentalists and Accountants.

Primary and secondary data were employed in this study. The primary data were obtained from 100 questionnaire administered on 40 top management and senior staff of the major oil companies in the upstream oil sector operating in Nigeria, 40 accountants practising in

the oil producing region and 20 environmentalists located around the oil producing states. These were done through a stratified random sampling method with a view to eliciting responses on environmental accounting issues, environmental degradation and study the strategies adopted by the oil companies in conducting their affairs in the oil producing region. Stratified random sampling method was employed because there was the need to separate subsidiary oil servicing companies from the major oil companies whose activities were usually implicated in major environmental hazards. This method helps sort out the problem likely to be caused by overlapping oil groups into a non-overlapping strata. Apart from time and cost advantage this method helps to avoid the possible bias that emanates if a systematic sampling from a non-stratified sampling frame is embarked upon.

Secondary data were collected with the aid of questionnaire in order to determine the economic losses to the nation due to the environmental degradation that occurred by the activities of the oil producing companies. The primary data were analyzed using percentage mean response in order to identify and assess the financial and environmental accounting issues associated with the exploration and drilling of oil by the oil and gas industries.

The attendant economic losses arising from the activities of the oil companies were analyzed using a time series regression analysis technique in order to account for losses in naira value, for the twenty-one years (1976-1996) inclusive. The formulated model used for the regression analysis is  $Q_{SP} = Q_R + Q_{LE} + e$

Where

$Q_{SP}$  = Quantity of oil that spilled

$Q_R$  = Quantity of oil recovered

$Q_{LE}$  = Quantity of oil lost to the environment

$e$  = Disturbance error term

Percentages were used to determine the adequacy of the existing legal framework governing the oil and gas exploration. Strategies employed by the oil and gas industry were identified and analyzed using the mean value of response on the intensity of use of each of the strategies and Friedman's analytical technique (a non-parametric analysis) was employed to determine the relative impact of strategies by rank.

## DISCUSSION OF RESULTS

Analysis of the responses as presented in table 1 (appendix 1) shows that most accountants who expressed their views on some vital environmental accounting issues believed that it is not only possible to

measure environmental cost (4.55) but it is also possible to account for environmental degradation (4.41). The need to continue to make environmental costs and information disclosure (4.56) as a general practice by oil and gas industry was equally high. El Serafy (1995) mooted that accountants are even better placed to point the way forward on more acceptable ways of quantifying environmental accounting issues or externalities to increase and ensure sustainable and liveable environment. The results obtained as discussed above appear to be a pointer in this direction.

The adequacy of the existing legal structure (4.33), the degree of compulsion of such laws on the oil and gas industry (4.68) and the extent of compensation received from the management of the oil and gas industry to the people of Niger Delta Region (2.1 2) appears inadequate because of the low mean response value which was less than 2.5, the expected average mean on a 5-Point Likert Scale. This perhaps may explain why the restive situation in the Niger Delta region remains unabated since the inhabitants of that region may not have been adequately compensated by the oil and gas industry whose activities devastate the environment of the inhabitants of those areas.

The economic losses that stem from environmental degradation and oil exploration related problems are presented in table 2, in the regression results  $Q_{SP} = 9.584 + 0.669 + e$  obtained by regressing the quantity of oil spilled against the quantity lost, about 66.9% of such was lost to the environment. Differently put, 0.669 is a constant factor that must be lost once there is an oil spillage arising from the activities of the oil and gas industry. The regression results also statistically revealed that the intercept 9.584 and the slope 0.0669 are both significant at  $P = 0.05$  because their standard error values are less than half of their parameter estimates of 9.584 and 0.669 respectively. Their corresponding t-values are equally significant at  $P = 0.05$  since their values are greater than the tabulated t-values of 0.216 and 0.83 respectively. The model is of good fit because of the high R-value of 94.4% and a high F value of 105.72. Moreover, the entire model appears not to have exhibited any form of autocorrelation with the disturbance error term  $e$  as a result of a Durbin-Watson (D-W) value of 2.07.

A comprehensive analysis of the causes of environmental problems was articulated by employing the cause and effect (fishbone) diagram (figure 3). There, the minor causes otherwise known as "ribs" and the main causes termed the "fishbone" were examined to determine the major environmental problem (fish head). This was done with a view to determining the strategies that were deployed to

enhance the management of accounting issues in the oil and gas industry. The mean rank of the eight identified strategies (table 4) using Friedman's ranking analytical technique revealed strategy (S<sub>1</sub>) Divide and Rule as the most frequently deployed strategy with the highest mean rank of 6.88. The order and intensity of use of other strategies are offensive (S<sub>2</sub>) (6.58), hold and maintain (S<sub>4</sub>) (5.42) aggressive (S<sub>5</sub>) (4.88), defensive (S<sub>6</sub>) (4.73), do nothing (S<sub>7</sub>) (4.19) and pre-emptive (S<sub>8</sub>) (3.50).

The oil firms rating of the impact of these strategies in terms of contribution to the enhancement of environmental management of accounting issues revealed significant differences in the mean ranks at 0.05 and 0.01 levels of significance (table 4).

### SUMMARY AND RECOMMENDATIONS

Some environmental accounting issues that stem from the activities of the oil and gas industry were identified and assessed as environmental costs (4.55), degradation (4.41), the need for information disclosure of oil and gas company's activities in their financial or annual accounts (4.56), the adequacy of the structural legal framework within which the oil companies operate (4.33) the effectiveness of such laws (2.3) and the extent of compensation received from the oil companies by the inhabitants of the oil producing regions (2.12).

For every oil spillage that occurred in the past twenty-one years (1976-1996), 66.9% of the total amount spilled was lost to the environment with their attendant environment hazards. A proper articulation of the minor and major causes of environmental problems was attempted using the fish-bone diagram or cause and effect diagram in order to determine the main cause(s) of the problem that the environment face. This was with a view to determining the effectiveness of strategies that were deployed to contain the identified environmental problems by the oil and gas industries.

The intensity of use or the impact of each of the eight identified strategies was ranked using the Friedman's ranked test technique and the results obtained are as follows: Strategy (S<sub>1</sub>) Divide and Rule Offensive (S<sub>2</sub>), Stick and Carrot (S<sub>3</sub>) Hold and Maintain (S<sub>4</sub>), Aggressive (S<sub>5</sub>) Defensive (S<sub>6</sub>) Do Nothing (S<sub>7</sub>) and Pre-emptive (S<sub>8</sub>).

The challenges posed by environmental degradation through desertification, deforestation, production and other environmental externality problems have not been adequately addressed by the management of oil and gas industries in Nigeria. Hence, sizeable quantity of oil continues to be lost through spillage. This continues to

be a drain on our fragile economy. Even the strategies deployed to improve their operations seem not to have made any appreciable impact on the inhabitants of the oil communities, because of the incessant outburst of hostilities in the Niger Delta region. To stymie these happenings, the following policy options are suggested in form of recommendations:

More detailed environmental information should be disclosed by companies operating in the oil sector in their financial or annual reports. Apart from making detailed disclosures by the management of oil and gas companies in their financial accounts or reports, costs should also be apportioned to each of the factors disclosed as externality charge. This would make their financial reports more lucid. The Accounting Standard board should make it mandatory for oil and gas companies operating in Nigeria to always present cost-based externality charges in their financial accounts or annual reports.

There is need to strengthen or add more muscle to the implementation of the existing laws and policy guidelines that govern the operations of the oil and gas companies in Nigeria. Law enforcement agents and other related statutory bodies charged with such responsibilities should be better equipped to carry out this arduous task:

Agencies such as Federal Environmental Protection Agency (FEPA) and the Department of Petroleum Resources (DPR) should embark on constant training and re-tooling of their staff on environmental programmes. These staff should liaise monitor and work with the oil and gas personnel in order to ensure that the oil and gas companies as much as possible perform their findings, within the laid down rules and regulations. Finally, a drastic change in the pattern and use of strategy should be embarked upon by the management of the oil and gas industry. A reversal as well as a combination of the use of the identified strategies should be adopted. For instance, pre-emptive strategy.

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**Table 1: Responses to questions on environmental and financial issues from accountants, environmentalist and managers of oil and gas industry**

| S/N | Variables   | 5  | 4  | 3 | 2 | 1 | Mean        |
|-----|---|----|----|---|---|---|-------------|
| 1.  | Can environmental costs be measured   | 70 | 20 |   |   |   | 5 5 0 4.55  |
| 2.  | Is it possible to account for Environmental degradation?  | 63 | 26 |   |   |   | 2 3 6 4.41  |
| 3.  | Do professional accountants have definite roles to play on environmental issues?                      | 30 | 20 | 5 | 5 | 0 | 4.65        |
|     | Is it possible to make environmental costs and information disclosure a general practice?             |    |    |   |   |   | 97 11 2 3   |
| 5   |   |    |    |   |   |   | 4.56        |
|     | Is there any exciting law that governs the operations of the oil and gas companies in Nigeria?        |    |    |   |   |   | 30 12 30 14 |
| 14  |   |    |    |   |   |   | 3.30        |
| 6.  | Assess the extent of Degradation/compensation of the Niger Delta region by the oil communities?       |    |    |   |   |   | 10 1 10 49  |
| 1   |   |    |    |   |   |   | 2.12        |
| 7.  | Is it legally binding on the oil company To compensate the oil companies?                             |    |    |   |   |   | 80 12 5 2   |
| 1   |   |    |    |   |   |   | 4.68        |
| 8.  | How adequate are the policy guiding The exploration and prospecting of oil in Nigeria?                |    |    |   |   |   | 63 14 13 3  |
| 2   |   |    |    |   |   |   | 4.33        |
| 9.  | Are you convinced the oil companies Have fully been complying with such Policies?                     |    |    |   |   |   | 10 8 3      |
| 60  |   |    |    |   |   |   | 19 2.30     |
| 10. | Does the country have adequate legal And institutional framework to tackle environmental degradation? |    |    |   |   |   | 34 50 6     |
| 5   |   |    |    |   |   |   | 5 5 4.03    |

Source: Field Survey, 2007

**Key**

- (5) = Strongly Agree
- (4) = Agree
- (3) = Neutral
- (2) = Disagree
- (1) = Strongly Disagree

**Table 2: A profile of quantity of oil spilled to the environment and the quantity lost in the process. (1976-1996)**

| Year         | No of Percentage Spills | Spilled | Quantity Recovered | Quantity to       | Quantity of Environment lost |
|--------------|-------------------------|---------|--------------------|-------------------|------------------------------|
| to           |                         |         |                    |                   |                              |
|              |                         |         |                    |                   | Environment                  |
| 1976         | 128                     |         | 26,157             | 7135.05           | 19,021.50                    |
| 1977         | 104                     |         | 32,879.01          | 1703.01           | 31,176.24                    |
|              | 94.82                   |         |                    |                   |                              |
| 1978         | 154                     |         | 489,294.75         | 391,445.00        | 97,849.75                    |
|              | 20.00                   |         |                    |                   |                              |
| 1979         | 157                     |         | 694,117.13         | 63,481.20         | 630,635.93                   |
|              | 90.85                   |         |                    |                   |                              |
| 1980         | 241                     |         | 600,511.02         | 42,416.83         | 558,094.19                   |
|              | 92.94                   |         |                    |                   |                              |
| 1981         | 238                     |         | 42,722.50          | 5,470.20          | 37,252.30                    |
|              | 87.72                   |         |                    |                   |                              |
| 1982         | 257                     |         | 42,841.00          | 2,171.40          | 40,669.60                    |
|              | 94.03                   |         |                    |                   |                              |
| 1983         | 173                     |         | 48,351.30          | 6,355.90          | 41,995.40                    |
|              | 86.85                   |         |                    |                   |                              |
| 1984         | 151                     |         | 40,209.00          | 1,644.80          | 38,564.20                    |
|              | 95.91                   |         |                    |                   |                              |
| 1985         | 187                     |         | 11,876.60          | 1,719.30          | 10,157.30                    |
|              | 85.52                   |         |                    |                   |                              |
| 1986         | 155                     |         | 12,905.00          | 552.00            | 12,353.00                    |
|              | 95.72                   |         |                    |                   |                              |
| 1987         | 129                     |         | 31,866.00          | 6,109.00          | 25,757.00                    |
|              | 80.83                   |         |                    |                   |                              |
| 1988         | 208                     |         | 9,172.00           | 1,955.00          | 7,217.00                     |
|              |                         |         |                    |                   | 78.69                        |
| 1989         | 228                     |         | 5,656.00           | 2,153.00          | 3,803.00                     |
|              |                         |         |                    |                   | 63.85                        |
| 1990         | 166                     |         | 14,150.35          | 2,092.55          | 12,957.80                    |
|              | 85.21                   |         |                    |                   |                              |
| 1991         | 258                     |         | 108,367.01         | 2,785.96          | 105,581.05                   |
|              | 97.43                   |         |                    |                   |                              |
| 1992         | 378                     |         | 51,187.90          | 1,476.70          | 49,711.20                    |
|              | 97.12                   |         |                    |                   |                              |
| 1993         | 453                     |         | 8,105.32           | 2,973.08          | 5,168.24                     |
|              |                         |         |                    |                   | 63.76                        |
| 1994         | 495                     |         | 35,123.71          | 2,335.93          | 32,787.78                    |
|              | 93.35                   |         |                    |                   |                              |
| 1985         | 417                     |         | 36,677.17          | 3,110.02          | 33,567.15                    |
|              | 19.52                   |         |                    |                   |                              |
| 1996         | 158                     |         | 39,913.67          | 1,183.81          | 38,719.86                    |
|              | 97.03                   |         |                    |                   |                              |
| <b>Total</b> | <b>4835</b>             |         | <b>2,382,373.7</b> | <b>550,234.19</b> | <b>1,832,189.49</b>          |

Source: Niger Delta Environmental Survey, Phase I Report (1997)

# REGRESSION RESULTS OBTAINED FROM TABLE 2

$$Q_{SP} = 9.584 + 0.669x \quad (1)$$

Parameter estimate at  $p < 0.05$

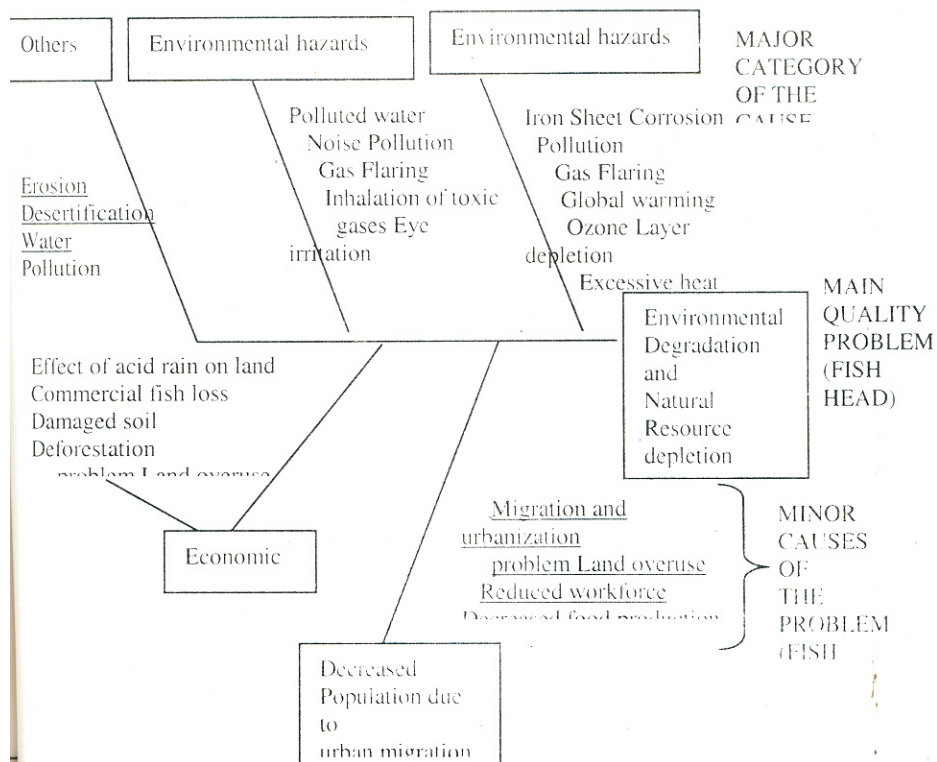
|              |                 |
|--------------|-----------------|
| R            | 94.4%           |
| R – Square   | 89.1%           |
| Adj R-Square | 88.2%           |
| Se           | (2.251) (0.056) |
| t – values   | 4.251, 10.283   |
| D- w         | 2.07            |
| F – value    | 105.72          |

Equation, \_\_\_\_\_ (1) can therefore be rewritten as

$$Q_{SP} = 9.587 + 0.669x$$

Se (2.251) (0.065)

Figure 3: Identification of some causes and effects of environmental factors due to the activities of the oil and gas industry in Nigeria – A TQM approach. (Fish Bone or Cause and Effect Diagram)



Source: Ishikawa, K. (1993) Modified

**Table 4: Distribution and ranking of strategies deployed to enhance environment accounting issues by oil and gas industries in Nigeria.**

|                   | Variables as strategies | Mean | Mean rank <sup>+</sup> |
|-------------------|-------------------------|------|------------------------|
| (S <sub>1</sub> ) | Divided and Rule        | 4.55 | 6.88                   |
| (S <sub>2</sub> ) | Offensive               | 4.25 | 6.58                   |
| (S <sub>3</sub> ) | Stick and Carrot        | 3.45 | 5.58                   |
| (S <sub>4</sub> ) | Hold and Maintain       | 3.44 | 5.42                   |
| (S <sub>5</sub> ) | Aggressive              | 3.15 | 4.88                   |
| (S <sub>6</sub> ) | Defensive               | 2.05 | 4.73                   |
| (S <sub>7</sub> ) | Do nothing              | 1.68 | 4.19                   |
| (S <sub>8</sub> ) | Pre-emptive             | 1.50 | 3.50                   |

Source filed survey, 2007.

1= never adopted      5= always adopted

Two – way ANOVA       $X^2_c = 21.96$        $X^2_{0.05} = 15.53$   
 $X^2_{0.01} = 20.01$       df=7

+=The Result of Friedman Two way Analysis of variance (AVOVA)

 $X^2_c$ =Computed chi- square $X^2_{0.05}$ = Tabulated chi- square value at 7df and 0.05 $X^2_{0.01}$ = Tabulated chi- square value at 7df and 0.01

Df= Degrees of Freedom