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E-Factor Valuation Model And Its Level Of Compliance To Provisions Of National Environmental Protection (Pollution Abatement In Industries And Facilities Generating Waste) Regulation Of 1991

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***Abstract*—Industries in Nigeria are one of the major sources of environmental pollution. Originally, valuation of these industries was done using the Cost Approach to Valuation. However, the cost approach has been widely critized because of its inability to consider the environmental pollution tendency of these industries in determining their values. As a result the Environmental Factor Adjusted Cost Approach to valuation (E-Factor) was developed. This paper therefore tried to evaluate the level of compliance of the E-factor model to the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991, since Estate Surveyors and Valuers are expected to play their role as environmental protection advocates. The study adopted the survey research method and data was generated using an evaluation checklist. The hypothesis developed was tested using the students "t" test and it was discovered that the E-factor model complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991. The study recommended among other things that the E-factor model should be used extensively in the valuation of industries and other facilities generating waste in Nigeria if Estate Surveyors and Valuers will continue to play their role as environmental protection advocates.**

***Keywords*—Valuation, E-factor model, Pollution, Industries, Evaluation, Environment, Environmental Protection.**

I. BACKGROUND OF THE STUDY

The twin issues of Environmental Management and Sustainable Development have been the focus of the world for the past two or three decades. Lead (1997) opined that proponents of these issues have called for a System Approach since no profession; no matter how well trained can claim an exclusive expertise in them. Ogunba (1999) while supporting this view calls for a multi-disciplinary approach in which all professionals should contribute their quota towards making the world a better place.

The Estate Surveyor and Valuer has by law been given the responsibility of interpreting the value of all categories of properties in Nigeria. Baum and Mackmin (1983) opined that valuation of landed properties is the art and science of estimating the value of interests in landed properties. Similarly, Deane, Gray and Steel (1986) in their work defined valuation as a professionally derived estimate of value, which is based on supportable conclusions, arrived at through a thorough and logical process of analysis of facts and data at a point in time. Ifediora (2009), while accepting this definition pointed out that valuation can only be accepted when it is done by a professional who has undergone elaborate training and has acquired some skills in the theories, principles, procedures and practice of valuation. In many countries of the world, the valuer is also required to acquire some level of statutory recognition by way of professional registration or acquisition of licence to practice. Further, Ifediora (2009) showed dis-satisfaction with the word 'estimate' as used in the definition. According to him, this connotes to many people a rough approximation of the true value which could still be obtained if a more careful investigation and analysis was carried out. Hence, Ifediora (2009) defined valuation as the art and science of determining, at some specific data, for a specific purpose(s), and by one authorized, the monetary value of a property right encompassed in an ownership; and value so determined.

In his valuation duties, the vauler in practice in Nigeria depends on a number of models which were developed decades ago by scholars in Europe. According Johnson, Davis and Shapiro (2000) opined that most standard textbooks in valuation recognize five standard valuation methods. Kalu (2001) while attesting to this recognized the three primary methods as the market, the income and the cost approaches. Olusegun (2000) equally enumerated the secondary or hybrid methods of valuation as the profit and residual methods. Finally, ifediora (2009) pointed out a sixth method of valuation which is peculiar to Nigeria; the statutory method. However, for the valuation of industries and other facilities generating waste in Nigeria, valuer usually adopt the Cost Approach. This is because the Cost Approach is used mostly for properties that are not income generating and have no comparables. Hence, the market and income approaches may be inapplicable due to dearth of information, lack of evidence of sales and general lack of information on circumstances surrounding sales.

However, the Cost Approach to Valuation has been grossly criticized by scholars because cost and value are not the same. Besides, the cost approach has no mechanism for addressing issues of pollution tendency of industries. Hence Aniagolu (2009) developed another model called "The Environmental Factor Adjusted Cost Approach to valuation (E-Factor model). It is against this background that this paper decided to evaluate the level of compliance of the E-factor model to the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991.

II. THE RESEARCH PROBLEM

As stated earlier in section I, the cost approach to valuation has been widely criticized by scholars in Nigeria because the method depends on the cost theory of value and valuers have come to accept that value and cost are not the same. Most importantly, Aniagolu, Iloeje and Emoh (2015) shows that the method has no inbuilt mechanism for checking the environmental pollution tendency of industries. Hence, Aniagolu *et al* (2015) published the E-factor model which was developed by Aniagolu (2009) as an extension of the cost approach.

The E-factor model tries to measure the rate at which industries in Nigeria comply with environmental protection standards in terms of Air, Water, Noise and Soil pollutions. The model equally measures the rate at which industries comply to solid waste management standards and compliance of industries to industrial health and safety standard. Since, Aniagolu, Odumodu and Anih (2016) had earlier demonstrated that the cost approach to valuation does not comply with the provisions of the Nigeria's National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991, this study in contrast, tries to evaluate the rate of compliance of the newly developed model (E-Factor Model) to the same regulation.

III. AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to evaluate the level of compliance of the E-factor Model to the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. In order to achieve this aim, the study intends to pursue the following line of objectives:

(a) To develop a checklist that will assist the work in evaluating the model using the provisions of the law as stated in the aim.

(b) To use the developed checklist to evaluate the E-factor model of valuation accordingly.

(c) To use the data generated from the said evaluation to test the relevant hypothesis.

IV. RESEARCH HYPOTHESIS

For proper investigation and testing of results from the evaluation checklist, the following hypothesis is put forward;

H_o: The E-factor Model does not comply with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991.

H_1: The E-factor Model complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991.

V. RESEARCH METHODOLOGY

The study made use of the evaluation research method. Murthy (2009) opined that evaluation research is primarily directed to evaluation of the performance of the developmental projects and other economic programme that have already been implemented. He further stated that evaluation research can be of three types namely con-current, periodic and terminal evaluation research. According to Odoziobodo and Amam (2007), Evaluation Research Method involves the collection of data about a person, a product or a technique of production. The aim of evaluation research is to take decisions about the character of the person, the value of the product or the soundness of the technique. Further, they pointed out that evaluation research could be in the form of formative evaluation, summative, character and action evaluations.

VI. DEVELOPMENT OF THE CHECKLIST FOR EVALUATION

In order to develop a checklist for the evaluation of the E-factor model to valuation, this work took a clue from the Scaling Method adopted by Ibiyemi (2004). In his work, he developed a scaling method for scoring the facilities required by industries to meet up with the standards provided in the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. The scaling method is presented in table 1 with necessary modifications.

Table 1:

Ibiyemi (2004)'s Scaling Method

S/N	PARAMETERS	CODE	ASSIGNED SCALE
1.	Pollution Monitoring Unit within the industrial premises with responsibility for pollution control assigned to a person or body accredited by NESREA	A	15
2.	Submission of a list of chemicals used in the industrial process including details of stored chemical and storage condition.	B	10
3.	Possession of pollution Response Machinery and Equipment which are readily available to combat pollution Hazards.	C	15
4.	Contingency Plan Approved by NESREA	D	10
5.	Facilities for collection, treatment, transportation and final disposal of solid waste	E	10
6.	Availability of NESREA discharge permit	F	10
7.	Installation of Environmental Pollution Prevention Equipment	G	20
8.	Evidence of preparation of Environmental Audit Report	H	10

Source: Adapted from Ibiyemi (2004)

From table 1, it could be seen that Ibiyemi (2004) assigned 15% to establishment of pollution monitoring unit in the industry, 10% to submission to National Environmental Standards Regulation Enforcement Agency (NESERA) the list of Chemical used in production processes and their storage condition, 15% to possession of pollution responses machinery and equipment by the industry. Again 10% was assigned to availability of contingency plan approved by NESERA, 10% to availability of facilities for collection treatment transportation and final disposal of waste generated by the industry, 10% to availability of NESERA discharge permit and 20% to installation in the industry a system of pollution prevention equipment that will reduce the release of gaseous, particulate, liquid or solid untreated substances into the atmosphere or surroundings. Finally, the method assigned 10% to availability of evidence of preparation of Environmental Audit Report (EAR). The scaling method was then adapted for the development of a checklist for the evaluation of the level of compliance of the E-factor Model to the provisions of National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991 as follows:

a. ***Parameter one:*** This parameter evaluates the establishment of pollution monitoring unit within the premises of industry with responsibility for pollution control assigned to person or body accredited by NESERA. To evaluate the ability of the E-factor Model to meet this parameter, the checklist will evaluate the following:

i. The ability of the E-factor Model to determine the value of the Pollution Monitory Unit (PMU)

ii. The ability of the E-factor Model to determine the depreciation level of the PMU

iii. The ability of the E-factor Model to determine the extent to which the PMU prevents / reduces air and noise pollutions

iv. The ability of the E-factor Model to determine the extent to which the PMU prevents or reduces water pollution and

v. The ability of the E-factor Model to determine the extent to which the PMU prevents or reduces soil pollution.

The checklist assigns 15% to this parameter and a six scale evaluation method was adopted as follow: Excellent, Very good, Good, Fair, Poor and none. The weighted marks assigned are 3.0 marks, 2.5 marks, 2.0 marks, 1.5 marks, 1.0 mark and 0 marks respectively.

b. ***Parameter Two:*** Parameter 2 evaluates submission of a list of all chemicals used in the industrial processes to NESERA including details of stored chemicals and storage condition. In order to evaluate this parameter, the checklist will assess the following:

i. The ability of the E-factor Model to assess the availability of the list of chemicals.

ii. The ability of the E-factor Model to determine the value of the storage facility.

iii. The ability of the E-factor Model to determine the effect of the chemicals on air quality.

iv. The ability of the E-factor Model to determine the effect of the chemicals on water quality and

v. The ability of the E-factor Model to determine the effect of the chemicals on soil quality.

As adapted from Ibiyemi (2004) this parameter is assigned 10% and the same six scale evaluation method adopted. However, the marks assigned to the scales changed as follows 2.0 marks, 1.6 marks, 1.2 marks, 0.8 marks, 0.4 marks and 0 marks respectively.

c. ***Parameter Three:*** Again this parameter measures the possession of pollution response machinery and equipment which are readily available in the industry to combat pollution. The evaluation by the checklist will assess the following:

i. Ability of the E-factor Model to determine the availability of such pollution response machinery and equipment in the industry.
ii. The ability of the E-factor Model to determine the cost and depreciation of the said machinery and equipment.
iii. The ability of the E-factor Model to measure the extent to which the said machinery and equipment combat air and noise pollution in the industry and its environs.
iv. The ability of the E-factor Model to determine the extent to which the machinery and equipment reduces water pollution
v. The ability of the E-factor Model to determine the extent to which the machinery and equipment can combat soil pollution

This parameter carries 15%. Also the same six scale evaluation method was adopted by the checklist. The weighted scores are the same with parameter one.

d. ***Parameter Four:*** Availability of a contingency plan approved by NESERA in the industry is assessed by parameter four. For the evaluation, the checklist will assess the following:

i. The ability of the E-factor Model to assess the availability of the contingency plan.
ii. The ability of the E-factor Model to determine the extent to which this plan can help reduce air / noise pollution
iii. The ability of the E-factor Model to determine the extent to which the said plan can prevent or reduce water pollution
iv. The ability of the E-factor Model to determine the extent to which the plan can prevent or reduce soil pollution
v. The ability of the E-factor Model to determine the extent to which the contingency plan can uphold industrial health and safety.

Parameter four is assigned 10% by the checklist. Again the six scale evaluation method was used and the weighted scores adopted in parameter two was uphold.

e. ***Parameter Five:*** This parameter evaluates the facilities for collection, treatment, transportation and final disposal of solid waste from the industry. The checklist will evaluate the following:

i. The ability of E-factor Model to determine the cost of the facilities.
ii. The ability of E-factor Model to determine the depreciation of the waste management / disposal facilities
iii. The ability of the E-factor Model to determine the efficiency of the waste disposal facilities
iv. The ability of the E-factor Model to determine the ratio of biodegradable and non-biodegradable content of the solid waste
v. The ability of the E-factor Model to determine the extent to which the said facilities can reduce or prevent soil pollution

The scaling method assigned 10% to this parameter and the six scale evaluation method was still adopted. The scores are the same as in parameter two and four.

f. ***Parameter Six:*** Parameter six evaluates the availability of NESERA discharge permit in the industry. The checklist will as well assess the following:

i. The ability of E-factor Model to assess the availability of NESERA discharge permit
ii. The ability of the E-factor Model to determine the extent to which the discharge permit can enhance the value of the industry
iii. The ability of the E-factor Model to determine the extent to which the discharge permit can help reduce water pollution
iv. The ability of the E-factor Model to determine the extent to which the discharge permit can help reduce soil pollution
v. The ability of the E-factor Model to determine the extent to which the discharge permit can help promote industrial health and safety

The checklist assigns 10% to this parameter. The same six scale evaluation method was adopted and the weighted scores adopted in parameter two, four and five were adopted.

g. ***Parameter Seven:*** Also parameter seven evaluates the installation (in the industry) of Environmental Pollution Prevention Equipment. To assess this parameter the checklist will evaluate the following:

i. The ability of the E-factor Model to determine the cost of such environmental pollution prevention equipment

ii. The ability of the E-factor Model to determine the accrued depreciation of the equipment
iii. The ability of the E-factor Model to determine the extent to which such equipment reduces air/noise pollutions
iv. The ability of the E-factor Model to determine the extent to which such equipment reduces water pollution
v. The ability of the E-factor Model to determine the extent to which the said equipment can help reduce soil pollution

Parameter seven was assigned 20%. The six scale evaluation criteria was also used for the evaluation. However, the weighted scores for the assessment are 4.0 marks, 3.5 marks, 3.0 marks, 2.5 marks, 2.0 marks and 0 marks respectively.

h. ***Finally, Parameter Eight***: Parameter eight evaluates the availability of Environmental Audit Report (EAR) in the industry. In order to assess this parameter, the evaluation checklist will evaluate the following:
i. The ability of the E-factor Model to assess the availability of the EAR in the industry
ii. The ability of the E-factor Model to determine the extent to which the report can help reduce air/noise pollution
iii. The ability of the E-factor Model to determine the extent to which the EAR report can help reduce water pollution
iv. The ability of the E-factor Model to determine the extent to which the report can help reduce soil pollution
v. The ability of the E-factor Model to determine the extent to which the report can help uphold industrial health and safety

Finally, parameter eight was assigned 10%. The same six scale evaluation criteria were adopted and the weighted scores are the same as in parameters two, four, five and six.

VII. RESULT OF THE EVALUATION OF THE E-FACTOR MODEL USING THE DEVELOPED CHECKLIST

Table 1 of this study shows clearly the scaling method proposed by Ibiyemi (2004). This scaling method is presented in figure 1.

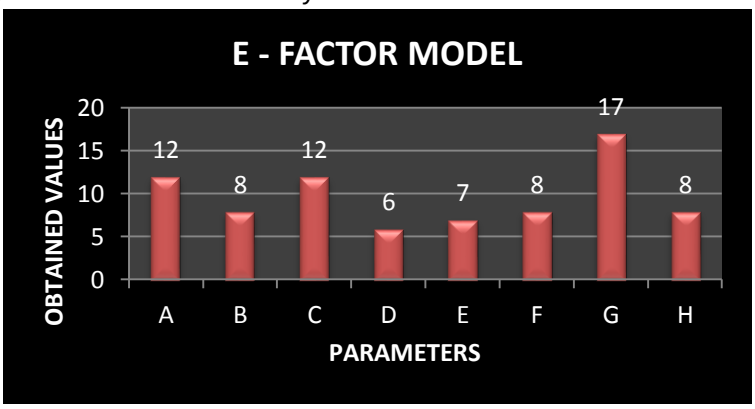

Fig.1: Bar Chart showing the Scaling Method adapted from Ibiyemi (2004)

The parameters discussed in section VI of this work was then used to measure the level of compliance of the cost approach to valuation to the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. The result is presented in figure 2.

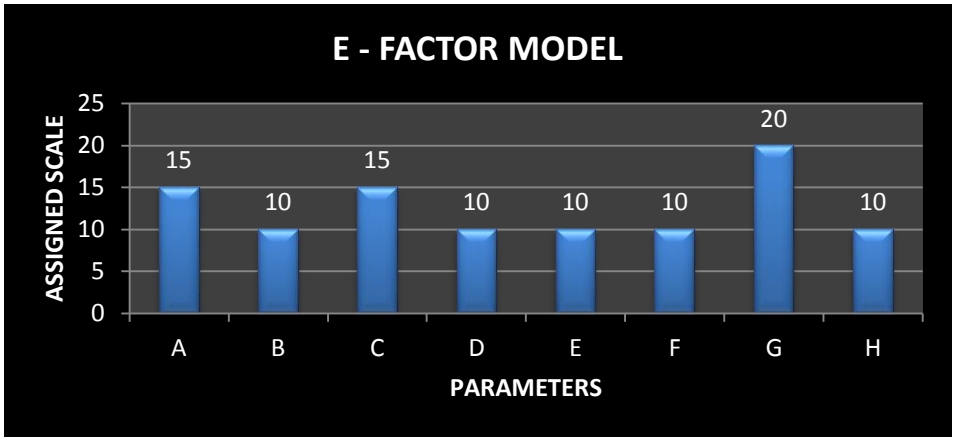

Fig. 2: Bar Chart showing the Level of Compliance of the Cost Approach to the Relevant Law.

The result achieved in figure 2 was then compared with the standard set in figure 1. The result is presented in figure 3.

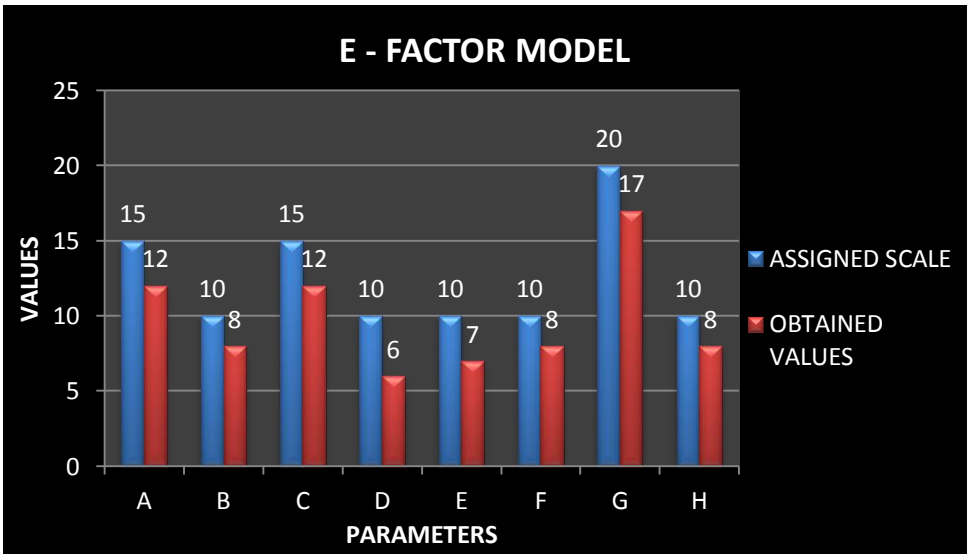

Fig. 3: Bar Chart showing the Comparison between the Scaling Method in Fig. 1 and the results achieved in fig.2

The summary of the result from the evaluation of the checklist is presented in table 2.

Table 2.
Summary of the Result from the Checklist

S/N	Parameters	Assigned scaling	Marks Obtained
1.	Pollution Monitoring Unit within the industrial premises with responsibility for pollution control assigned to a person or body accredited by NESREA	15	12
2.	Submission of a list of chemicals used in the industrial process including details of stored chemical and storage condition.	10	8
3.	Possession of pollution Response Machinery and Equipment which are readily available to combat pollution Hazards.	15	12
4.	Contingency Plan Approved by NESREA	10	6
5.	Facilities for collection, treatment, transportation and final disposal of solid waste	10	7
6.	Availability of NESREA discharge permit	10	8
7.	Installation of Environmental Pollution Prevention Equipment	20	17
8.	Evidence of preparation of Environmental Audit Report	10	8
	Total	100	78

Source: Field Survey, 2016

From table 2, it could be seen that out of the 15% assigned to parameter one, E-factor Model obtained 12%. Similarly out of the 10% assigned to parameter two, the method obtained 8%. Again, out of the 15% assigned to parameter three, the method obtained 12%. Also parameter four was assigned 10% and E-factor Model made 6%. Moreover, the approach made 7% out of the 10% assigned to parameter five and for parameter six, the approach made 8% out of the allocated 10%. However, out of the 20% assigned to parameter seven, the E-factor Model obtained 17%. Finally, the method obtained 8% out of the 10% assigned to parameter eight. In all, the E-factor Model to valuation obtained 78% out of the allocated 100%.

VIII. TEST OF HYPOTHESIS

As stated in section IV of this work, the null hypothesis states that the E-factor Model to valuation does not comply with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. To test the hypothesis the students "t" test was used. The result is presented as follows:

a. At $\alpha = -0.5$, a two tailed test is applied giving
$t = -0.025; (14) = 2.145, -t, 0.025; (14) = -2.145$
i.e the table value

b. Calculate the pooled sample variance

$$S^2p = \frac{(n_1 - 1)\,S_1^2 + (n^2 - 1)\,S_2^2}{n_1 + n_2 - 1}$$

$$= 15.14$$

c. Calculate;

$$t = \frac{\overline{X}_1 - \overline{X}_2 - \Delta o}{\sqrt{Sp^2\,(1/n^1 + 1/n^2)}}$$

$$= 1.542$$

d. Decision: Since $t = 1.542 < 2.145$, we reject Ho and conclude that the E-factor Model to valuation does complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991.

IX. DISCUSSION OF FINDINGS:

Estate Surveyors and Valuers in Nigeria are expected to play their role as environmental protection advocates by protecting the environment during property valuation exercise. Industries in Nigeria are heavy polluters of the environment. Valuers normally use the cost approach to valuation for the valuation of industries because most industries are not income producing and do not have comparable sales evidence, these shortcomings led to the development of the E-factor model. This paper then tried to evaluate the E-factor Model to determine whether it complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991.

The paper then tried to develop a checklist for the evaluation. The checklist was adapted from Ibiyemi (2004) as presented in table 1 (with slight modifications). The parameters for the checklist were eight in number and the checklist developed five questions each for the eight parameters. The scaling method proposed by Ibiyemi (2004) was also adapted with slight modification. The evaluation method adopted a six scale evaluation method of Excellent, Very good, Good, Fair, Poor, None.

The evaluation shows that out of the total of 100% assigned to the eight parameters, the E-factor Model obtained 78%. The result from the evaluation was then used to test the hypothesis which states that the E-factor Model to valuation complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. The students "t" test was used for the test of hypothesis. Since the calculated t = 15.14 is greater than the table t = 2.145, we rejected the null hypothesis and accepted the alternate hypothesis. We therefore concluded that the E-factor Model to valuation as practiced in Nigeria complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991.

X. RECOMMENDATIONS

The paper recommends that the cost approach, as used in Nigeria, should be applied with caution by valuers in Nigeria since the method does not provide an answer to industrial pollution in Nigeria. Rather valuers should adopt new models such as the E-factor Adjusted Cost Approach to Valuation as proposed by Aniagolu (2009). This model was developed to incorporate remedies to environmental pollution. Also new models should be developed by real estate researchers to help the valuer in practice to remain relevant as environmental protection advocates. The new trends in valuation should also be included in the curriculum of tertiary institution in Nigeria where courses in Estate Management and property valuation are thought. Finally government should make new laws or review already existing law to ensure that all profession in Nigeria key into the

Systems Approach to environmental management in Nigeria

XI. CONCLUSION

This paper clearly shows that the E-factor Model to valuation (as practiced in Nigeria) complies with the provisions of the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. Valuers in Nigeria should therefore use the method extensively if they will continue being relevant as professionals in Nigeria.

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