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A Model For Integrating Environmental Considerations Into The Valuation Of Industries In Enugu Urban Area, Nigeria.

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Abstract
In Nigeria, the Estate Surveyor and Valuer has been bestowed with the responsibility of interpreting value of properties for various purposes. In carrying out this responsibility, the Valuer depends on models which were developed decades ago. These models in themselves have implied environmental considerations by way of neighbourhood analysis. The models do not consider serious environmental problems such as air, water, soil, noise pollutions and industrial health and safety. This work developed a model for integrating these variables into the valuation of industries using Enugu as a study area. The model developed is referred to as The Environmental Factor Adjusted Cost Approach to Valuation (or in short from "The E-factor Model"). The model was found to conform with the provisions of the Nigerian Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulations of 1991. The model is therefore recommended for use by the Nigerian Institution of Estate Surveyors and Valuers in the Valuation of Industries and other facilities generating waste in Nigeria.
KEY WORD: Valuation, Industries, Environment, Model, Environmental Considerations.

I. THE BACKGROUND:

The United Nations Conference on Human Environment (UNCHE) held in 1972 at Stockholm was convened to evolve intensified action at national and international levels to limit and where possible eliminate the impairment of the human environment (Aniagolu, 2009). In the final documents of the conference, the interaction between environment and development was formally recognized, notably in several principles of the Stockholm Declaration (Ikwuegbu, 2002).

In 1982, a special session of United Nations Environmental Programme (UNEP) governing council was held to review progress made since the Stockholm Conference ten years earlier. The conclusion was that more long-term and integrated Environmental planning was needed. What followed after was series of Environmental Conferences at regional levels which later culminated in the Earth Summit in Rio Brazil in 1992.

Since the Earth Summit in Brazil, the seriousness of the twin issues of Environmental Management and Sustainable Development became more pronounced in many countries of the world (Aina and Salau, 1992). According to Lead (1997) proponents of these twin issues call for a systems Approach, since no profession, no matter how well trained in techniques can claim an exclusive expertise in them. Ogunba (1999) called 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 in Nigeria has been bestowed with the responsibility of interpreting the value of all categories of properties. Baum and Mackin (1989) opined that the Estate Surveyors concept of value is from a strictly economic perspective, based on the premise that legal interest on land and building are exchanged for money and are scarce resources. This concept of value has been seriously criticized.

From Environmental Management point of view the concept of Total Economic Value (TEV) comes in. Organization for Economic Co-operation and Development (OECD, 1989) pointed out that the concept of TEV is of central importance in valuing Natural and Man-made environment since it provides a perspective on various kinds of benefit that accrued from environmental preservation and improvement. Ogunba (1999) classified this value into the Use Value, the Option Value and the Non-use Value. Bishop (1982) observed that the use value is somewhat related to the existing use value, exchange value and alternative use value concept of the Estate Surveyor and Valuer. He however regretted that most surveyors neglect the option and non-use values while interpreting value to properties. Perhaps this was what Aina (1992) saw, when he stated

> *"... lack of proper environmental consideration has resulted in a habitual over-valuation of environmentally unsound properties ... But we can change this false valuation syndrome....*

However, the Estate Surveyor and Valuer holds the ace and are in the best position to call the shots…"

Ogunba (1999), buttressed Aina's (1992) position by concluding that Estate Surveyors and Valuers should be in the forefront of Environmental Valuation Model Development. It is against this background that the researcher decided to develop a model that will integrate environmental consideration into the valuation of Industries in Nigeria.

II. THE PROBLEM

Over the years a number of models have been developed by scholars to help the valuer in practice carry out valuation for all purposes. According to Ifediora (2009) these methods include the Market, Cost, Income approaches and the residual and profit methods. These models which were developed decades ago have some implicit environmental considerations built into them by way of neighbourhood analysis.

With recent world focus on environment, many countries of the world are beginning to adopt various policies aimed at protecting the environment. In Nigeria, Federal Environmental Protection Agency (FEPA), National Environmental Standards Regulation and Enforcement Agency (NESREA) and the Federal Ministry of Environment and Urban Development were at one time or the other established. Regretfully, Aina and Salau (1992) pointed out four impediments to environmental protection in Nigeria as absence of effective resource pricing instrument, lack of appropriate instrument and Techniques for environmental damage costing, absence of economic incentives and disincentives for natural resource conservation and absence of a system of natural resource accounting and auditing. Ogunba (1999) summerised these problems into a problem of absence of an institutionalized system of Environmental valuation technique for resource conservation.

Little wonder then that the Nigerian Institution of Estate Surveyors and Valuers (NIESV) in a communiqué issued after its 29th Annual Conference in Calabar 1999 stated, *interalia:*

"That the institution should play a more prominent role as an environmental protection advocate and uphold relevant heads of claim for compensation on environmental issues".

This calls for research into valuation models that will take explicit care of environmental considerations while interpreting values of properties. Since one of the greatest polluters of the environmental is industry, this work focuses on developing a property valuation models that will integrate environmental consideration into the valuation of industries in Nigeria.

III. THE AIM AND OBJECTIVES

The aim of this work is to develop a model that will integrate environmental considerations into the valuation of industries in Nigeria. To achieve this aim, the work tried to identify the models currently in use in the valuation of industries in Nigeria. It then explored the implicit environmental considerations in these models. The work finally developed a model that would consider environmental pollution and industrial health and safety during the valuation of industries.

IV. THE METHODOLOGY

In developing the model this work adopted both the survey research and the experimentation research methods. According to Odoziobodo and Amam (2007), Experimental research is the manipulation of experimental variables to ascertain that one is related to or has any effect on the other. Also Anyadike (2009) described survey research as one that tends to cover a large population of people by taking and studying samples from the population.

V. VALUATION MODELS CURRENTLY IN USE IN NIGERIA

Kalu (2001) opined that most standard valuation text books recognize five valuation methods which are also in use in Nigeria. Olusegun (2000) enumerated them as the Market, Cost and Income Approaches, then the Profit and Residual Methods. Ifediora (2009) recognized a sixth method of valuation which is peculiar to Nigeria and that is the statutory method. The processes in these models are discussed in details.

a. Market Approach to Valuation:

According to Deane *et al* (1986) this method can also be called comparative method, market data approach, sales comparison approach, the direct Sales Comparison (DSC) Approach. Ficek *et al* (1999) pointed out the processes involved in this method as:

- Gather data on comparable sales and analyze the data.
- Compare the comparable sales with the subject property and adjust for differences
- Correlate to arrive at value estimate.

Ifediora (2009) pointed out that any valuer using this method should be aware of the following shortcomings:

i. It is difficult to find comparable sales for purpose build industries,
ii. Lack of sales in specific types of properties in an area makes it difficult to find comparables
iii. Sale evidence from a prior date may not be considered comparable especially in an irregular economy like ours

iv. Lack of knowledge about conditions surrounding or influences sales may affect value and
v. Information surrounding sales may be hearsay since data banks do not exist.

b. Cost Approach to Valuation

Ogbuefi (2002) stated that the method can also be called the contractors, Replacement Cost, Re-instatement Cost or the Depreciated Replacement Cost Methods. Kalu (2001) stated that the method involves the following steps:

i. The estimation of value of land as if vacant,
ii. The estimation of the current cost of replacing the existing improvements
iii. Calculation of accrued depreciation
iv. Deduction of accrued depreciation from the replacement cost (new) to arrive at the depreciated replacement cost (DRC) and
v. The addition of the value of land to the DRC. Valuation of Industries in Nigeria is mostly done with this model.

Ifediora (2009) also pointed out that this method of valuation should be used with care since value and cost are not the same. Again a building that has depreciated structurally may have acquired some historical importance.

c. Income Approach to Valuation:

Aluko (2004) opined that other names for the method are investment or capitalization method. Millington (1995) summerised the steps in the method as follows:

i. Estimate the anticipated net income from the property,
ii. Determine the appropriate years purchase (YP) and
iii. Capitalization of the said net income with the selected years purchase.

Ajayi (1998) enumerated the problems associated with this method of valuation as follows:

i. The method cannot be used in an irregular and erratic economy like ours
ii. In an unstable economy, determination of a suitable YP is not easy,
iii. It is not easy to establish the proportions of earnings that is attributable to the property,
iv. The method requires so many assumptions and estimates, etc.

d. Residual Method of Valuation

Umeh (1977) asserted that this method is also referred to as Developmental Valuation because it can be used to achieve the developmental potentials of landed property. Millington (1995) stated that the method adopts the following steps in arriving at "surplus to land:

i. Determine the highest and best use of the property,
ii. Estimation of the open market value of the said highest and best use,
iii. Estimation of the cost of carrying out the necessary work required to put the landed property to the proposed highest and best use,
iv. Deduction of the cost of development from the gross developmental value to arrive at the "surplus for land".

Ifediora (2009) pointed out the flaws of this method as follows:

i. It is abstract in nature
ii. it depends on so many assumptions,
iii. It is based on a lot of forecast.

e. Profit-Basis Method of Valuation

This method is also referred to as the Accounts method or Treasury method. The method is based on the assumption that the value of some properties will be related to the profit which can be made from their use (Millington,1995). Aniagolu (2009) stated the steps involved in the method as follows:

i. Determine gross earnings from all sources,
ii. Determine the cost of purchases (consumable stock, add opening stock and less closing stock),
iii. Determine gross profit by deducting purchase from gross earnings,
iv. Determine the net profit by deducting expenses of the business only
v. Divide the net profit between the factors of production excluding labour and
vi. Capitalize the portion accruing to land.

Ifediora (2009) x-rayed the problems with the method as:

i. The assumption that the gross earnings of a business is related to the rent of the property is not conclusive,
ii. Where there are inadequate or incomplete accounting records, this method cannot be use and
iii. There is no clear cut rule for dividing the net profit among the factors of production.

f. Statutory Method of Valuation:

Valuers have argued vehemently that this method is not a model because it has no methodology or procedure of its own. Kalu (2001) stated that statutory valuations are those whose purpose, basis and methodology are statutorily regulated. He further explained that valuation relating to taxation, compulsory acquisition, compensation, rating and landlord and tenant act belong to this category. Ifediora (2009) stated that the only procedure in this method is to find out the provisions of the law and implement it. Aniagolu (2009) pointed out that a major constraint to this method of valuation is that in Nigeria many laws have not been reviewed for decades. Kalu (2001) enumerated some of the important laws that guide statutory valuation as

follows: Public Land Acquisition Act (Cap 167 Laws of the Federation of Nigeria (LFN) 1958, Public Land Acquisition Miscellaneous Provision Decree of 1976, Land Use Decree No. 6 of 1978 (Now Land Use Act Cap 202 LFN 1990), Control of Rent Edict of various states and Landlord and Tenant Acts of various state.

VI. Environmental Considerations Implied In These Valuation Models:

The valuation models discussed in section 5.0 have some implied environmental considerations. In the Market Approach, Ifediora (2009) described it as neighbourhood analysis. Hence value is transferred from comparable properties to the subject property by making reference to population density, street patterns and conditions, accessibility, use zoning, availability of social amenities, access to shops, schools, churches and availability of nuisance or environmental hazards. Hence the valuer will find out if the subject property is in superior, inferior or same location with the comparables. This does not consider the role a property plays towards environmental degradation rather it looks at the general neighbourhood condition.

In the cost Approach, Aniagolu (2009) pointed out that the implied environmental consideration is manifested in the value of land and in the computation of depreciation. Hence, if we take Enugu, Nigeria as an example value of land in Independence Layout or Government Reservation Area (GRA) is greater than that of Ogui New Layout or Uwani Layouts. The difference in value is attributed to differences in environmental qualities.

For the income approach, Aluko (2004) believes that it starts with the neighbourhood analysis which was explained under the market approach. However, Baum and Crosby (1988) brought in the issue of property risk and rental growths. These may include tenant risk, sector risks, structural risk, taxation risk, environmental risk, planning risks, legal risk, comparative risk, timing risk, and holding period risk. Hence environmental problems are implicitly built into these risk factors before determining capitalization rates used for property valuation.

Again in Residual method of valuation, the implied environmental consideration is reflected in the area of determining the Highest and Best Use of the property with special reference to planning permissions. According to Aniagolu (2009), before determining the highest and best use, a comparison should be made between what the property should be in its best state and what it is at the time of the valuation.

Finally, in the Profit Basis Method, it manifests partly in the rate of interest used in capitalizing the accrued rent and partly in the location factors that help in determining the percentage of the net profit that is apportioned to land in the form of rent. Hence, the contributions location and neighbourhood made to the profit of the business must be considered.

It must be pointed out that since the statutory method used in Nigeria does not have principle of its own, the environmental consideration in the method depends on the provision of the law. If the law goes out to protect the environment then implied environmental consideration will be seen, where not, the law will be silent on environmental issue.

VII. THE MODEL

a. Name of the Model

The proposed valuation model is referred to as "The Environmental Factor Adjusted Cost Approach to Valuation", or in short form "The E-Factor Model".

b. Nature of the Model:

As was pointed out in section 5.0 of this work the method of valuation widely used in Nigeria for the valuation of industries is the Depreciated Replacement Cost (DRC) method. This is because the method is used mostly for properties that do not have comparables and are not income producing. Hence the E-factor model is an extension of the Cost approach to valuation.

E-factor measures the rate of compliance of industries to Environmental standards as contained in the National Environmental Protection (Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. As such valuers are expected to inspect pollution abatement facilities alongside their normal inspection of land, building, plants, machinery, equipment, motor vehicles, furniture and fittings.

In formulating this model the researcher tried to avoid a complex, academic and highly technical model because experience has shown that such models as the Real Value Approach, The Rational Model and The Discounted Cash Flow Techniques are still seeking recognition in Nigeria after over two decades of their existence.

c. The Basic Assumptions of the Model:

In determining the Replacement Cost of an industry, the following component are necessary; value of land (V_L), machinery and equipment (V_{PME}), Value of Motor Vehicles (V_M) and Value of Furniture and Fittings (V_{FF}). Hence the first assumption of the E-factor model is that land, building, improvement and furniture & fittings on their own do not relatively pollute the environment. Consequently, the E-factor model would only affect plant, machinery equipment and motor vehicles which are heavy polluters of the environment.

Secondly, the Cost Approach to Valuation has been criticized by many scholars as mentioned in section 5.0 of this work. But 98% of industrial valuations done in Nigeria are done with Cost

Approach. Hence, the second assumption is that notwithstanding the shortcomings of the method, this model adopts it the way it is practiced in Nigeria.

d. Data Requirement for the E-Factor Model:

The data required for the E-factor model includes:

i. Data on the level of Air pollution within and the surroundings of the industries.
ii. Data on the level of pollution from effluents discharged by the industry.
iii. Data on the level of soil pollution and by implication the neatness of their waste disposal system.
iv. Data on the level of noise generated by the industry and
v. Data on the level of compliance of the industry *to industrial and health safely standards.*

These 5(five) parameters are on equal footing in the determination of the rate at which the industry pollutes the environment hence the models assigns 20% to each of the parameters making it a total of 100%.The rationale is that all parameters must be good for a healthy environment to exist, so one is as good as the other .

e. Data Collection Procedure for the E-Factor Model.

i. Air Pollution:

The E-Factor model assigns 20% (or 20 marks) to industrial Air Quality. In analyzing the air pollution level in the industry, air samples at different locations of the industry should be tested in–situ with appropriate gas detectors. The readings from the industry are then compared with the Federal Ministry of Environment/World Health Organization (FMENV/WHO) Standards. This would help detect those readings that are within stipulated limits (WSL) and those above stipulated limit (ASL).The ones above the stipulated limit constitute deviation.

The deviation from FMENV/WHO is worked out from the 20marks assigned to Air Quality and the result is the Air pollution coefficient. The pro-forma shown in table 1 could be used:

Table 1
FMENV/WHO AIR QUALITY STANDARD PRO-FORMA.

Parameters	Methodology	FMENV/ WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	remarks
Dust Particles	Gasometer	NS	X	x			x
Carbon II Oxide (CO)	"	1 – 5	X	x			x
Sulphur IV Oxide (SO_2)	"	0.5	X	x			x
Carbon IV Oxide (CO_2)	"	1 – 5	X	x			x
Nitrogen IV Oxide (NO_2)	"	0.085	X	x			x
Ammonia (NH3)	"	0.2	X	x			x
Hydrocarbons	"	6.0	X	x			x
Chlorine	"	1.0	X	x			x
Hydrogen cyanide	"	NS	X	x			x

Source: Adapted from Aniagolu (2009).

ii. Water Pollution :

Again the model assigns 20% (or 20marks) to water quality standard. In analyzing water quality, water sample is taken from the effluent discharge point and sent to the laboratory for analysis. The analysis includes physical, chemical and microbiological analysis. The result from the sample is again compared with the FMEVN/WHO standard. The deviation is equally expressed as a percentage of the total marks assigned to water Quality. The result is the water pollution coefficient. Table 2 shows the pro-forma for the comparison.

Table 2
FMEN/WHO Air Quality Standard Pro-forma

Parameters	Methodology	FMENV / WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	remarks
(a) Physical Analysis							
Odour	-	NS	X	X			X
Colour (Haven Unit)	Lovibond	25	X	X			X
Ph (31^{0C})	Meter	6.5 – 9	X	X			X
Conductivity (chm/km)	Meter	1000	X	X			X
(b) Chemical Analysis							
Acidity Ng/Ica/Co_3	Microbiological	400	X	X			X
Alkalinity Mg/LCa/Co_3	Microbiological	30 – 500	X	X			X
Total Solid Mg/L	A.P.H.A	2000	X	X			X
Dissolved Solids Mg/L	A.P.H.A	500	X	X			X
Suspended Solids Mg/L	A.P.H.A	30	X	X			X
Calcium Mg/L	E.D.T.A	75	X	X			X
Magnesium Mg/L	E.D.T.A	Not 230	X	x	x	x	X
Total Hardness Mg/L	E.D.T.A	50 – 200	X	x			X
Sodium Mg/L	Flame Photometer	NS	X	x			X
Potassium Mg/L	"	NS	X	x			X
Copper Mg/L	"	NS	X	x			X
Zinc Mg/L Ca/Co_3	ASS	200	X	x			X
Iron Mg/L	Spectrophotometer	0.3	X	x			X
Manganese Mg/L		0.1-0.5	X	x			X
Lead PPM		0.01	X	x			X
Chloride Mg/L	"	250	X	x			X
Sulphate Mg/L	"	250	X	x			X
Nitrate Mg/L	"	50	X	x			X
COD Mg/L	A.P.H.A	80	X	x			X
BOD Mg/L	A.P.H.A	30	X	x			X
Dissolved Oxygen Mg/L		NS	X	x			X
(c) Microbiological Analysis							
E-Coli 100ml	Microbiological	-ve	X	x			X
Coliform 100ml	Microbiological	100	X	x			X
Total Plate Count	Plate count	100	X	x			X

Source: Adapted from Aniagolu (2009).

iii. Soil Pollution:

The model further assigned 20% (or20marks) to soil pollution .However it divided soil pollution into effective solid waste management system and soil element analysis. The 20 marks was shared equally to the two. For solid waste management the valuer is expected to perform the following analysis:

a. Solid waste collection method was assigned 2.5 marks. The valuer is expected to weight the collection system as follows poor – 0.5mark, fair – 1.0mark, good – 1.5marks, very good – 2.0marks and excellent 2.5marks.
b. Percentage of solid waste that is non-biodegradable was also given 2.5marks. the weighted index is as follows 75 – 100% -0.5marks, 50-74% - 1.0mark, 25-49% - 1.5marks, 1-24% - 2.0marks, none – 2.5marks.
c. Availability of waste recycling machine was awarded 2.5marks. The valuer should inspect the waste recycling machine and weight it as follows: poor – 0.5mark, fair – 1.0mark, good – 1.5marks, very good – 2.0marks and excellent 2.5marks.
d. Waste disposal method was finally assigned 2.5marks. The valuer will also inspect the waste disposal system and score as follows: poor – 0.5mark, fair – 1.0mark, good – 1.5marks, very good – 2.0marks and excellent 2.5marks.

The second part of the analysis is for the soil element analysis. Soil sample from the waste dumpsite of the industry should be collected and sent to a reputable laboratory for soil element analysis. The result should be compared with the FMENV/WHO standard and the deviation expressed as a percentage of the total points. The result obtainable is the soil pollution co-efficient. Table 3 and 4 show the pro-forma for comparison of solid waste management system and soil element analysis respectively.

Table 3:
Solid Waste Management System Assessment Pro-forma

S/No	Parameters	Maximum Points Obtainable	Points Obtained	Deviation	Rate of Compliance	Rate of Non Compliance	Remarks
1	Collection methods	2.5	x	x	xx	xx	x
2.	% Non Biodegradable	2.5	x	x			x
3.	Availability of Recycling Equipment	2.5	x	x			x
4.	Disposal Method	2.5	x	x			x

Source: Adapted from Aniagolu (2009)

Table 4:
Soil Elements Analysis Pro-forma

Parameters	Methodology	FMENV/ WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	Remarks
(b) Element Analysis					xx	Xx	-
Calcium (Ca)		NS	x	X			X
Magnesium (Mg)		2 – 10	x	X			X
Sodium (Na)		NS	x	X			X
Iron (Fe)		0.5-1.0	x	X			X
Aluminium (Al)		10-100	x	X			X
Lead (Pb)		1 – 20	x	X			X
Zinc (Zn)		0.10-300	x	X			X
Copper (Cu)		20	x	X			X
Manganese		0.20-300	x	X			X

(Mn)							
Silica (Si)		NS	x	X			X
Titanium (Ti)		NS	x	X			X
Cadmium (Cd)		0.03-0.3	x	X			X
Loss on Ignation (Lol)		NS	x	X			X

Source: Adapted from Aniagolu (2009)

iv. Noise Pollution:

For noise pollution the valuer should check noise levels at various points in the industry / factory especially at the noise generating points. Noise is measured in decibels (dBA) hence an instrument for measuring noise or a Radio shack sound level meter calibrated in dBA should be used. The noise level should then be compared with the FMENV/WHO Standard and the deviation computed as a percentage of the 20marks which the model also assigned to Noise level. The result is the noise pollution co-efficient. Table 5 shows the noise level analysis pro-forma.

Table 5
Noise Level Analysis Pro-forma

s/N	Parameters	Methodology	FMENV / WHO Standard (dBA)	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	Remark
1.	Administrative block	Radio Shack	90	X	X			X
2.	Workshop Area	Sound Level	90	X	X			X
3.	Generator Area	Meter	90	X	X			X
4.	Distribution Area		90	X	X	X	x	X
5.	Security Post		90	X	X			X
6.	Waste Treatment Plant		90	X	X			X

Source: Adapted from Aniagolu (2009)

v. Industrial Health and Safety:

In analyzing industrial Health and safety the model still assigned 20marks (20%) to this parameter. To assess this, the valuer has to inspect and score each of the following parameters:

a. Availability of Clinics/first Aid Kits (Boxes)
b. Availability of functional firefighting equipment e.g fire alarm, fire service, fire extinguisher, etc.
c. Availability and use of safety devices e.g helmets, hand gloves, eye goggles, ear muffs, boots, overall, nose masks, etc.
d. Availability of Environmental auditing / reporting procedures
e. Availability of functional facilities for collection, treatment, transportation disposal of waste generated by the industry.
f. Establishment of a pollution monitoring unit within the industry.
g. Availability of list of chemical used in the industrial processes, including details of stored chemical and storage condition.
h. Possession of pollution response machinery and equipment which are readily available to combat pollution hazards.
i. Availability of FEPA/NESREA discharge permit.
j. Installation of pollution prevention equipment that reduces the level of pollution in the industry.

The model assigns 2marks each to the parameters listed. The valuer after inspecting the facilities should score the industry according to the following weights: poor – 0.4mark, fair – 0.8mark, good –

1.2marks, very good – 1.6marks and excellent 2.0marks. the deviation is then expressed as a % of the allotted marks. The result is the *industrial Health and Safety co-efficient.*

F. The Environmental Factor (E-Factor) Adjusted Cost Approach (Model) To Valuation:

The Valuer after scoring all the parameters under Air, Water, Soil, Noise Pollutions and Industrial Health and Safety, has to work out the percentage rate of compliance and percentage rate of non-compliance of the industry to environmental standard. Table 6 shows the summary pro-forma.

Table 6:
Pro-forma Summary of E-Factor Analysis

S/No	Parameters	ANAMMCO	
		Compliance Rate %	Non-Compliance Rate %
1.	Air Quality	x	X
2.	Effluent Discharge	x	X
3.	Solid Waste Management	x	X
4.	Soil Quality	x	X
5.	Noise	x	X
6.	Industrial Health and Safety	x	X
	Total	x	X

Source: Adapted from Aniagolu (2009)

If the rate of non-compliance of an industry is represented by (X), then the rate of compliance is (1–X) or (100 – X). Therefore,

E-Factor = 1 – X or 100 – X

The E-factor Adjusted cost approach to valuation then is:

$EDRC = V_L + V_{BI} + V_{FF} + [(V_{PME} + V_{MV}).\ E\text{-factor}]$

Where:

EDRC = E-factor Adjusted Depreciated Replacement Cost
V_L = Value of Land
V_{BI} = Value of Buildings and Improvements
V_{FF} = Value of Furniture and Fittings
V_{PME} = Value of Plant, Machinery and Equipment
V_{MV} = Value of Motor Vehicles
E-Factor = Rate of Compliance of the Industry to Environmental Standards

VIII. Merits and Demerits of the Model.

8.1 Merits

The E-factor model has the following advantages. First, it is best used to value special purpose industries and other facilities generating wastes. Second, the model is inevitable where the market and income approaches cannot be applied. Third, the method has excelled because it combines the cost and labour theories of value. Fourth, the model succeeded in examining the effect of Air Pollution tendency of an industry on the value of the industry. Fifth, it equally considered the effect of effluent discharge quality of an industry on the value of the industry. Sixth, the model tried to determine the effect of soil pollution tendency of an industry on the value of the industry. Seventh, it also considered the effect of un-abated noise on the value of an industry. Finally, the model makes the value of an industry dependent on the ability of the industry to adhere to stipulated Health and Safety Standards.

8.2 Demerits:

Not-minding the advantages discussed above, the E-factor model still inherited some disadvantages for the traditional Depreciated Replacement Cost Approach as follows: First, it is still based of the cost theory of value and we know that cost and value are not the same. Second, the model does not consider historical cost of properties that may have depreciated physically but may have acquired a lot of historical importance. Finally, the method cannot accurately determine accrued depreciation of an industry.

This calls for further research into these pertinent areas.

IX. Recommendations:

This work has developed the E-factor model (which is an extension of the DRC approach) for the valuation of industries and other facilities generating waste in Nigeria. The paper therefore recommends that the model be adapted by the Nigerian Institution of Estate Surveyors and Valuers (NIESV) and made part of their guidance notes for valuation of industries in Nigeria. Also the model should be accepted by Valuers in practice since it is not too academic. Finally, the model should be made part of the valuation curriculum of tertiary institutions in Nigeria that produce valuers of tomorrow.

X. Conclusion:

This paper which focuses on developing a model that will integrate environmental considerations into the valuation of industries in Nigeria has developed; The Environmental Factor (E-Factor) Adjusted Replacement Cost Approach to Valuation. The model will therefore help the valuer in practice to interpret correctly the value of industries and other facilities generating waste in Nigeria. The model is therefore recommended for use by all categories of valuers in Nigeria.

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