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Performance Indicators for Identified Constraint Factors to Sustainable Engineering Projects Delivery in Enugu State, Nigeria[1]

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ABSTRACT
There is an interlock of engineering construction activities with sustainability of our infra-structural development. The construction activities deplete our natural resources which are major threat to our ecological environment. Engineering construction activities culminate into destroying our natural ecosystem; air, land and water pollution; greenhouse gas emissions, heating up the ozone layer, erosion, flooding and associated hazards. The study identified constraint factors to sustainable engineering projects by assessing the performance indicators for constraints to achieve sustainable project delivery in the study area. Nine local government areas (three each from the three senatorial zones of the state) were sampled based on urbanization and population of inhabitants in the area. A total of four hundred (400) questionnaires were distributed to stakeholders in the built environment while three hundred and forty four (344) representing 86.0% of the respondents were returned and used for the analysis. The data was analyzed with percentage analysis, mean score using five point likert rating scale, severity index/ranking, regression and correlation analysis. The results show that incentive factors ranked first with grand mean score of 4.05 and severity index of 81.0% followed by economic factors and project factors. The least in ranking was technical and technological factors. There are other factor variables which were ranked to determine which of these affect sustainable projects delivery in the study area. The work concluded that sustainable projects would offer a holistic approach by integrating sustainability at the design, execution and whole life assessment maintenance in order to achieve environmental safety and cost effective projects over their life cycle. The study recommends that capacity building through education, training, skill and bridging knowledge gap of project participants; product innovation towards sustainable materials; community participation at the design/construction stages would mitigate the constraint factors to achieve sustainable engineering projects delivery in Enugu State.
Keywords: Sustainability, Sustainable buildings, Constraint factors, Sustainable design and execution.

I. INTRODUCTION

Construction activities deplete our natural resources which are major threat to our ecological environment. Sustainable building were sought for because of the discomfort like, destroying our natural ecosystem, air, land and water pollution, greenhouse gas emissions, heating up of the ozone layer, erosion, flooding and associated hazards. Sustainable building design and subsequent construction seeks to reduce negative impact on the environment, improve the health and comfort of building occupants which improves building performance. Construction is one of the largest industries in both developing and developed countries in terms of investment, employment and contribution to Gross Domestic Product (GDP) of any Nation (Spence and Mulligan, 1995 cited in Ametepy, Ansah and Gyadu-Asiedu, 2020). The construction industry accounts directly and indirectly for nearly forty percent (40%) of material flow entering the world economy (Clement, Cheng and Hong, 2018); and in developing countries for around fifty percent (50%) of the total energy consumption (Ametepy *et al.*, 2020; Ibrahim and Price, 2005).

Aluko (2011) stated that, in Nigeria, many laws and regulations were enunciated at Federal, State and Local government levels for proper planning of the environment and building design architecture without integration of sustainability concepts. Most of the engineering projects are not sustainable which portends danger to the environment by degrading the natural design architecture. Although, the principal indicators for sustainable development are not integrated at the planning stage for most construction projects, their execution also lack proper monitoring by the policy makers (Udegbunam, Agbazue, and Ngang, 2017). These led to poor implementation during construction which drastically affects our living environment. For a building development project to be sustainable, it must have the ability to be sustained for a definite period without damaging the environment, or without depleting a resource (Hornby, Gatenby and Wakefield, 2000).

Building sustainability is fundamentally a process of best practices that leads to sustainable outcomes (Muldavin, 2010). Planning process is typically not conducted very well due to its complexity and extra costs that are always associated with it (Mansur, Chewan Putra, and Mohammed, 2003). The planning process does not encourage sustainability matter clearly and limited interactions between various disciplines have hindered sustainable engineering projects from reaching the expected achievement. There are minimal inputs from Operation and maintenance groups, construction managers and trade contractors or outside stakeholders during the design stage and the planning process which made sustainability principles hard to be incorporated in building of the projects (Construction Industry Development Board (CIDB), 2003).

The constraints to sustainable building of projects delivery in Enugu State, Nigeria is apt in this era where human related activities, burning of fossil fuel, green house gas emissions, and construction activities had led to variability in rainfall, temperature and other climatic conditions. These have resulted to food insecurity, deforestation, erosion induced gullies, unbalancing of ecosystem, pollution of air, land and water, loss of lives and properties in the state. In order to address the constraints to sustainable building projects delivery in Enugu State, there is need to identify the constraint factor variables that impair sustainable building projects delivery and address them for successful sustainable building of engineering projects delivery in the state.

II. LITERATURE REVIEW

2.1 Concept of Sustainable Development

World Conference on Environment and Development (WCED) (1987) referred to sustainable development as development that meets the needs of the present without compromising the ability of the future generation to meet their own needs and aspiration. United Nations (2011) referred to sustainable development as development that seeks to eradicate poverty which is a global challenge and the requirement to achieve sustainable requirement requires enhancement of global resources base by gradually changing the ways in which we develop and use technologies. Hornby and Wehmeier (2000) said that sustainable development is the process of developing; growth, directed change or application of new ideas to practical problems in formulating a course of action with the ability to be sustained for a definite period without damaging the environment or without depleting a resource, renewable. Munasinghe (1993) defined sustainable development as the interdependence between economic development, the natural environment and the people. Schumann (2010) said that sustainable development includes the integration of ecological, socio-cultural, economic, technical, process and location aspects in the planning and construction of engineering projects. UNCHS (Habitat) (1992) opined that sustainable development deals with improving the quality of human life, economically by minimizing non renewable energy sources etc., socially by reducing population pressure on resources like food and water etc. and politically through good governance. The researcher refers to sustainable development of engineering projects as an integrated and systematic approach of solving human shelter needs by taking into consideration the ecological, economic, socio-cultural, technical process and aspects of location in the planning and execution of building of the projects to minimize non renewable energy sources, sustain the biosphere with its diversity, preserve our natural resources for the present and future generations of the inhabitants on earth.

CIOB (2010) stated that sustainable developments of building of projects are inconsistent with conventional projects because of use of special materials, building practices and management commitment to sustainability of these projects. These required additional considerations whose implementations form major barriers as a result of knowledge gaps, communication shortfall, ownership structure, operating cost responsibility, family issues, risks, and other technical and process issues. The chances of delivering the projects successfully can be enhanced if there are modifications to the traditional planning and execution process through proper integration of sustainability concepts in the project delivery. Yudelson (2009) surmise that the process of planning for a sustainable building of projects is different from the traditional planning process due to its complexity and holistic approach. The process has the responsibility to deliver sustainable development goals throughout the project. This process requires decisions to be made in order to achieve sustainability standards so that maximum capital and whole life costs can be achieved (CIOB, 2010).

2.2 Constraints to Sustainable Projects Development

Sustainable construction has to take place by understanding of the political, economic social and developmental issues of a place, and that sustainable construction then becomes an integral part of sustainable development. Sustainable construction has not received sufficient attention in Nigeria even though it is an important aspect of sustainable development. The critical issue surrounding our construction activities is that construction systems have long been modeled on the experience of the developed world (Adindu, Musa, Nwajagu, Yusuf and Yisa, 2020). They contend that it has been assumed historically that norms and systems arising from a particular set of experiences in the developed world can be readily adopted by developing countries. The implication is that this type of thinking typified the stage of economic growth, whereby the economic emergencies of nations were hypothesized to be consistently and universally similar, thus ignoring national circumstances, value systems or current priorities. This is inappropriate where principles of the developed world have been applied without modification in our construction environment with its diversity of problems. The issues of conflicts and wars, and pandemics that have implication for sustainable construction have become another perspective of the debate around sustainability in our development setting (Adebayo, 2000).

The government policies in areas of housing, economics, environment and spatial planning affect sustainable development and construction and have direct implications on the construction industry and related development issues. These policies are concerned with alleviation of poverty, employment creation, capacity building, quality of environment etc. but most of these policies do not enhance the objective of sustainability. The situation is compounded by the lending policies of the International Monetary Fund (IMF) and the World Bank with structural adjustment which have had considerable impact on our construction industry. The policies advocate for reduction in public spending and restructuring of the public sector and privatization of assets. This process has created unemployment in certain sectors, and some of these labour forces are absorbed by the construction sector (Adebayo and Adebayo, 2000). Most of construction activities impact on the built environment and these projects focus on the economics angle, and negate the aspects of quality of environment, preservation of green architecture, water and sanitations etc. There are other pertinent issues such as infrastructure and services provision, energy and water as constant requirements for the success of the construction sector. The intensive consumption of these by the construction industry and their perpetual shortage result to waste disposal on construction sites disposal of byproducts of construction materials as well as unused building materials which become an environmental concern.

III. RESEARCH METHODOLOGY

The research study adopted a descriptive survey design approach. This is to prevent ambiguity and inconsistency in responses. The descriptive survey approach describes the characteristics of existing situation and provides insight into the research problems by describing the variables of interest in order to achieve the aim and objectives of this research study (Mugenda and Mugenda, 2003). The population of Enugu State was projected to be 5,441,900 as at 2023 based on the last census of 2006. The sample study was carried out from Nine local government areas which comprise Awgu, Enugu East, Enugu North, Enugu South, Igbo Etiti, Igboeze North, Nsukka, Oji River, and Udi of the state with a total projection population of 3,672,971 as at 2023 (National Bureau of Statistics (NBS), 2023). The study adopted the stratified random sampling techniques. This is because different disciplines of registered professionals were sampled who had varied knowledge, experience, exposure and interest based on their occupation. Sixty percent (60 %) of the sample was randomly selected using a sample frame while forty percent (40 %) will be randomly selected from each of the professional disciplines in the built environment.

Nine local government areas (three each from the three senatorial zones of the state) were sampled based on urbanization and population of inhabitants in the area. A total of four hundred (400) questionnaires were distributed to stakeholders in the built environment while three hundred and forty four (344) representing 86.0% of the respondents were returned and used for the analysis (See table 1). The primary data was collected through questionnaires while secondary data was obtained from journals, textbooks, seminar papers and occasional publications. The data was analyzed using common size percentage analysis, mean score using five point likert rating scale, severity index/ranking, regression and correlation analysis. The sample population for the study comprised prospective estate developers, stakeholders in the built environment in both public and private sectors.

IV. RESULTS AND DISCUSSION

Table 1: Questionnaire Distributed and Retrieved

S/N	Senatorial Zone	Number distributed		Number Retrieved		Number not returned	Percentage not returned
			%		%		(%)
A	Enugu East Senatorial Zone						
(i).	Enugu North LGA	54	13.5	49	90.7	5	9.3
(ii).	Enugu East LGA	53	13.25	43	81.1	10	18.9
(iii).	Enugu South LGA	53	13.25	45	84.9	8	15.1
B	Enugu West Senatorial Zone						
(i).	Oji River LGA	40	10	32	80.0	8	20.0
(ii).	Udi Local Government Area	40	10	35	87.5	5	12.5

(iii).	Awgu LGA	40	10	33	82.5	7	17.5
C	Enugu North Senatorial Zone						
(i).	Nsukka LGA	40	10	36	90.0	4	10.0
(ii).	Igbo-Eze North LGA	40	10	34	85.0	6	15.0
(iii).	Igbo-Etiti LGA	40	10	37	92.5	3	7.5
Total		**400**	**100**	**344**	**86.0**	**56**	**14.0**

Source: Researcher Field Survey Report (2022)

From table 1, a total of four hundred questionnaires were distributed to the respondents in the area of study. The selected local government areas and senatorial zones were shown with the questionnaires distributed and their percentages according to the various local governments in the sample survey. A total number of three hundred and forty-four (344) questionnaires were retrieved representing eighty six percent (86%) of the total number administered to respondents.

Table 2: Category of Respondents

S/N	Characteristics	Frequency	Percentage (%)
(a).	Construction Professionals		
(i).	Builders	22	6.4
(ii).	Architects	36	10.5
(iii).	Quantity Surveyors	18	5.2
(iv).	Land Surveyor	9	2.6
(v).	Estate Surveyor	16	4.7
(vi).	Town Planners	27	7.8
(vii).	Geography and Meteorologists	14	4.1
(viii).	Environmental Engineers/Managers	12	3.5
(ix).	Engineers		
	Civil/Structural Engineers	25	7.3
	Electrical Engineers	12	3.5
	Mechanical Engineers	10	2.9
	Geotechnical Engineers	6	1.7
	Total	**207**	**60.2**
(b).	Building and Civil Engineering Contractors	21	6.7
(c).	Manufacturers and suppliers of Building Materials/Products	62	18.0
(d).	Others	54	15.7
	Total	**344**	**100**

Source: Researcher Field Survey Report (2022)

In Table 2, the Category of Respondents includes all professional in the built environment in order to benefit from their expertise on perspective of sustainable building projects delivery in Enugu State. A total of two hundred and seven (207) professional in the built environment responses were retrieved which represents 60.2% of the respondents. The Building and Civil Engineering Contractors were twenty-one (21) representing 6.7% of the respondents. The total number of respondents for Manufactures and Suppliers of Building Materials/Products were sixty-two (62) representing 18.0% of the respondents and others which include Policy Makers, interest groups, developers etc. have a total number of fifty-four (54) respondents representing 15.7%.

This study identified the constraint factors to sustainable building projects delivery in the study area. These include the Economic factors; Education, training, skills and knowledge gap; Project factors; Design related factors; Technical and Technological Factors; Construction factors; Site Related Factors; Criteria Cost Risk Factors; Perception Factors; Process and Regulatory Factors; and Incentive Factors. The constraints were identified and discussed in the following tables from the responses of respondents as stated in the questionnaires.

The Likert scale of 1 to 5 was used where 1 = Strongly Disagree (SD), 2 = Disagree (DA), 3 = Undecided (UD), 4 = Agree (AG) and 5 = Strongly Agree (SA). The decision rule is that any of the variables with a weighted mean score of less than 3.25 or Severity Index (S.I.) of less than sixty-five percent (65%) from the results of the responses from the respondents is not considered as a constraint factor as contained in all the variables.

Table 3: Perception of Respondents on Constraint Factors associated with Economic Factors to Sustainable Building Projects Delivery

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	mean	S.I %	Rank
a.	**Economic Factors**									
1.	Lack of demand by clients to stimulate competition	–	7	48	187	102	1416	4.12	82.3	2nd
2.	Limited competition among suppliers, subcontractors and contractors	–	–	64	197	83	1395	4.06	81.1	4th
3.	Inflated cost of building projects	–	33	43	122	146	1413	4.11	82.2	3rd
4.	High exchange rate on imported building products	–	24	40	108	151	1355	3.94	78.8	6th
5.	High interest rate charges on long payback period	–	–	59	128	157	1474	4.28	85.7	1st
6.	High premium on new innovations (e.g. Solar Panels)	–	48	61	103	132	1351	3.93	78.5	7th
7.	Lack of adequate basic infrastructure by government	–	–	86	141	117	1266	3.68	73.6	8th
8.	Scarcity of basic economic resources	–	14	62	163	105	1391	4.04	80.9	5th
	Grand Mean							**4.02**	**80.4**	

Source: Researcher Field Survey Report (2022)

In Table 3, The respondents strongly agreed that high interest rate charges on long payback period is one of the major constraint factors to sustainable building projects delivery with mean value of 4.28 which shows a severity index of 85.7% followed by lack of demand by clients to stimulate competition with mean value of 4.12 and severity index of 82.3%. The least in the mean score of 3.68 and severity index of 73.6% is lack of adequate basic infrastructure by government. The result shows that to achieve sustainable projects delivery the first ranked high interest rate charges on long payback period will discourage investors since cost of capital is high which will make the building of these projects very expensive. The clients may not demand sustainable project in order to reduce competition. High exchange rates and inflated cost of building of projects with the harsh economic conditions in Nigeria will be a major challenge to the implementation. Lack of competition among supplies, subcontractors and contractors are controlled by the demand of users due to high cost of products and new innovation which is not affordable to majority of inhabitants due to poor salaries and wage structure especially in Enugu State.

The Grand Mean on Economic factors was 4.02 with the severity index of 80.4%. None of the mean values is less than 3.25 which shows that all the listed variables in the Economic factors are the constraint factors to sustainable building of projects development in Enugu State.

The information in Table 3 was represented in the graph on Figure 1

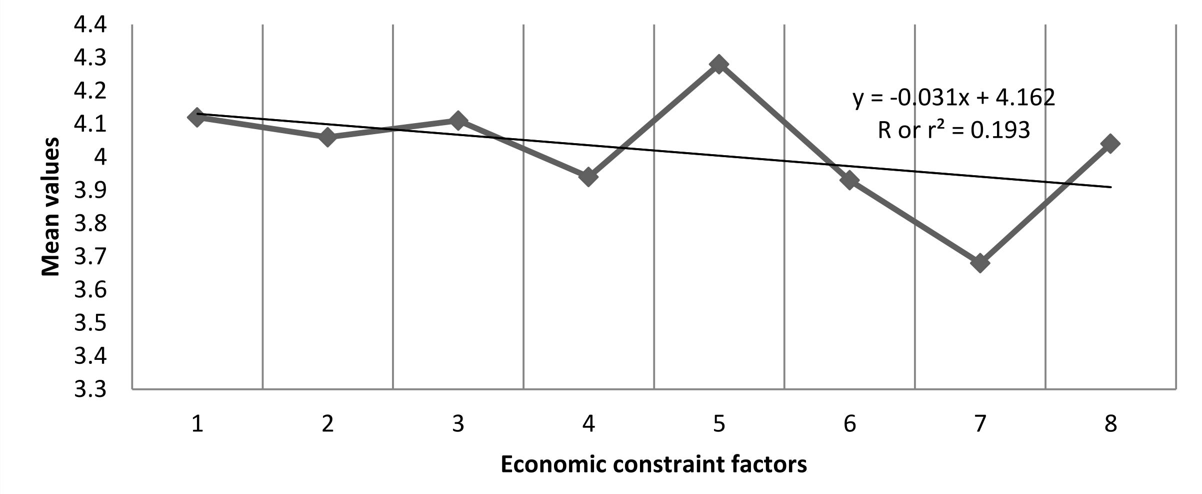

Figure 1: Mean values against Economic constraint factors

In Figure 1, the graphical estimation shows that, Y= 0.031x + 4.162 and r^2 or R = 0.193. The coefficient of correlation, r = $\sqrt{R}$ = $\sqrt{0.193}$ = 0.4398. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 14 from the Correlation coefficient table is 0.3383. The implication is that since the critical value of the coefficient of correlation is less than the calculated value, it shows that economic factors constitute a major constraint to sustainable building projects delivery in the state. This was further explained in testing the hypothesis.

Table 4: Perception of Respondents on Constraint Factors associated with Education Training Skills and Knowledge Gap

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	Mean	S.I . %	Rank
b.	**Education Training, Skills and Knowledge Gap**									
1.	Misconception and misperception of real costs	–	46	94	77	127	1317	3.83	76.6	7th
2.	Low knowledge and understanding of sustainable practices.	–	31	53	145	115	1376	4.00	80.0	3rd
3.	Non-familiarity with green products	–	28	56	136	124	1388	4.03	80.7	2nd
4.	Lack of accessible dependable source of information on sustainable products and processes	–	22	59	125	138	1411	4.10	82.0	1st
5.	Dearth of skills resulting in unnecessary requirement	–	42	83	90	129	1338	3.89	77.8	6th
6.	Skill gap that inhibit uptake and quality of end product	–	19	66	144	115	1387	4.03	80.7	2nd
7.	Lack of trained green projects professionals	–	53	32	155	104	1342	3.90	78.0	5th
8.	Lack of developers experience	–	105	24	131	84	1226	3.56	71.3	8th
9.	Resistant to change (resistant to adopt innovation)	–	41	52	139	112	1354	3.93	78.7	4th
							Grand Mean	**3.92**	**78.4**	

Source: Researcher Field Survey Report (2022)

From Table 4, Lack of accessible dependable source of information on sustainable products and processes has the highest mean rating of 4.10 with a severity index of 82.0%. The least of the mean score rating is 3.56 representing a severity index of 71.3% which is lack of developer's experience. However, the grand mean result for the Constraint Factors associated with Education Training Skills and Knowledge Gap was 3.92 representing a severity index of 78.4%.This indicates that Education Training Skills and Knowledge Gap is one of the major Constraint Factors on sustainable building projects delivery in Enugu State. The constraint factors associated education, training, skills and knowledge gap shows that lack of accessible dependable source of information on sustainable products and processes ranked first which is a major variable under this factor. Other variables like skill gap also inhibit uptake and quality of end products, lack of knowledge and understanding of sustainable practices, non-familiarity with green products and others as stated and ranked in the table 4 shows that factors on education, training, skills acquisition of projects participants and knowledge gaps need to be addressed for sustainable projects delivery in Enugu State.

The information in Table 4 was represented in the graph on Figure 2.

Figure 2: Mean values against Education Training Skills and Knowledge Gap constraint factors

In Figure 2, The graphical estimation shows that, Y = -0.020x + 4.023 and r^2 or R = 0.128. The coefficient of correlation, r = $\sqrt{R} = \sqrt{0.128} = 0.3578$. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 16 from the Correlation coefficient table is 0.3170. Since the critical value of the coefficient of correlation (r) = 0.3710 is less than the computed value of r = 0.3578, it shows that education, training, skills and knowledge gap is a major constraint to sustainable projects delivery in the state.

Table 5: Perception of Respondents on Constraint Factors associated with Project Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	mean	S.I .%	Rank
c.	**Project Factors**									
1.	Type, size, capacity of projects	–	38	87	100	119	1332	3.87	77.4	4th
2.	Level of certification (greenness) desired	–	52	33	134	125	1364	3.97	79.3	3rd
3.	Location of project	–	44	36	116	148	1400	4.07	81.4	2nd
4.	Sustainable design standard used (LEED)	–	40	25	142	137	1408	4.09	81.9	1st
							Grand Mean	**4.00**	**80.0**	

Source: Researcher Field Survey Report (2022)

The information in Table 5 shows that Under Project Factors Constraint to sustainable design standard used like Leadership in Energy and Environmental Design of the United States has the highest mean rating of 4.09 representing a severity index of 81.9%. This is followed by location of project with mean value of 4.07 representing 81.4% severity index and mean value of 3.97 representing severity index of 79.3% for level of certification (greenness) desired on item 2. The least mean score rating of 3.87 representing a severity index of 77.4% was on type, size and capacity of the building. The grand mean score rating on project factors is 4.00 with a severity index of 80.0%.This shows that project factor variables as indicated in the questionnaire responses are among the Constraint Factors hampering the sustainable delivery of projects in Enugu State. On project factors the ranking first shows the sustainable design standard is lacking in the study area, followed by location of projects, level of certification required with type, size and capacity of engineering projects are variables which constitute constraints to sustainable building projects delivery in the study area.

The information in Table 5 was represented in the graph on Figure 3.

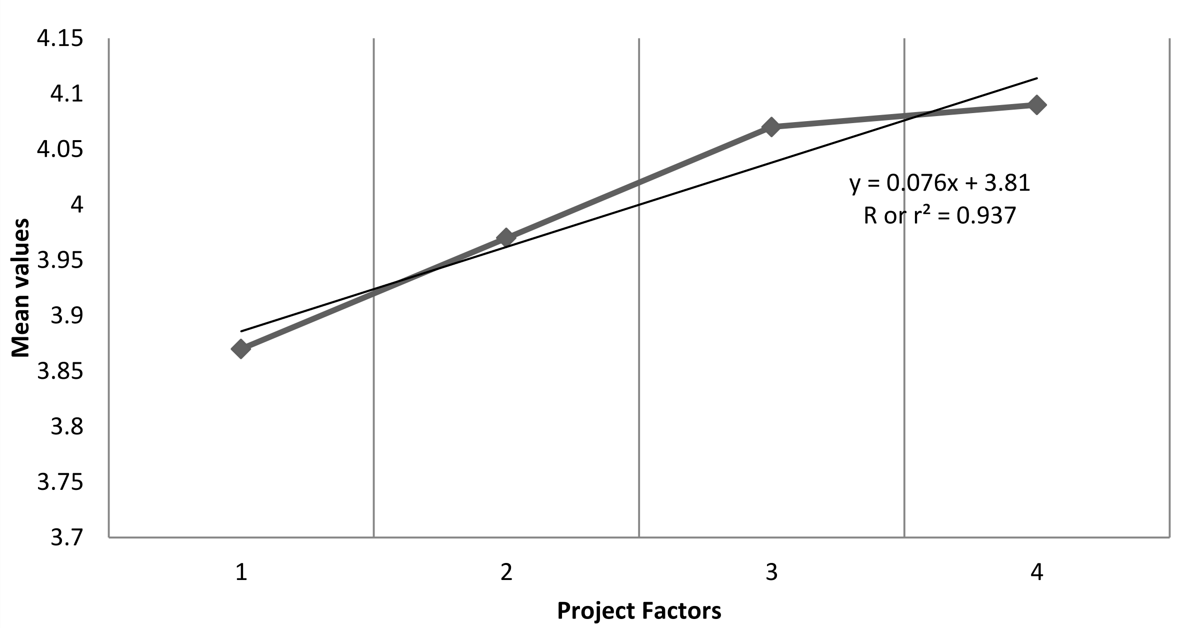

Figure 3: Mean values against Project Factors

In Figure 3, the graphical estimation shows that, Y= 0.076x + 3.81 and r^2 or R or r^2 = 0.937. The coefficient of correlation, r = $\sqrt{R} = \sqrt{0.937} = 0.9683$. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 6 from the Correlation coefficient table is 0.5067. The use of these statistical tools was further explained in the discussion of results. Also, the critical value of r = 0.5067 is less than computed value of r = 0.9683 which shows that project factors are one of the major constraint factor to sustainable engineering projects delivery to the state.

Table 6: Perception of Respondents on Constraint Factors associated with Design Related Factors

S/N	**Item**	**SD**	**DA**	**UD**	**A**	**SA**	$\sum Fx$	**mean**	**S.I. %**	**Rank**
d.	**Design Related Factors**									
1.	Lack of experience and low knowledge of design team	56	83	22	105	78	1098	3.19	63.8	5th
2.	Degree of standardization required	28	64	72	87	93	1185	3.44	68.9	4th
3.	Inclusion of luxury sustainable	24	34	64	108	114	1286	3.74	74.8	2nd
4.	Lack of clear design goal on sustainability	61	73	46	80	84	1085	3.15	63.1	6th
5.	Lack of in-house expertise	64	78	20	106	76	1084	3.15	63.0	7th
6.	Adaptation of passive design strategies (extended overhang, efficient lighting, double skin walls,	–	84	38	121	101	1271	3.69	73.9	3rd
7.	Flexibility of building used and	–	46	66	123	109	1327	3.86	77.2	1st
							Grand Mean	**3.46**	**69.2**	

Source: Researcher Field Survey Report (2022)

The information in Table 6 indicates that on Design Related Factors, constraint flexibility of building of projects used and design has the highest mean score rating of 3.86 representing a severity index of 77.2% "inclusion of luxury sustainable features ranked 2nd with mean value of 3.74 and severity index of 74.8%". The least in mean score rating of 3.15 with a severity index of 63.0% were for lack of in-house expertise. Lack of clear design goal on sustainability and lack of experience and low knowledge of design team have mean score rating of 3.15 with severity index of 63.1% and mean value of 3.19 with severity index of 63.8%. Item 1, 4 and 5 in the table were below the mean of 3.25 and severity index of 65.0%. These indicate that these variables are not Constraint Factors to sustainable projects delivery in the area. The grand mean score rating of 3.46 or severity index of 68.2% showed that some design related factors were still the Constraint Factors to sustainable projects delivery in the study area. The design related factors with variable of flexibility of building used and design ranking first shows that this feat have not been achieved in the study area. Other variables like inclusion of luxury sustainable features, adaptation of passive design strategies, degree of standardization required etc also confirm design related factors as major constraints to sustainable projects delivery in Enugu State.

The information in Table 6 was represented in the graph on Figure 4.

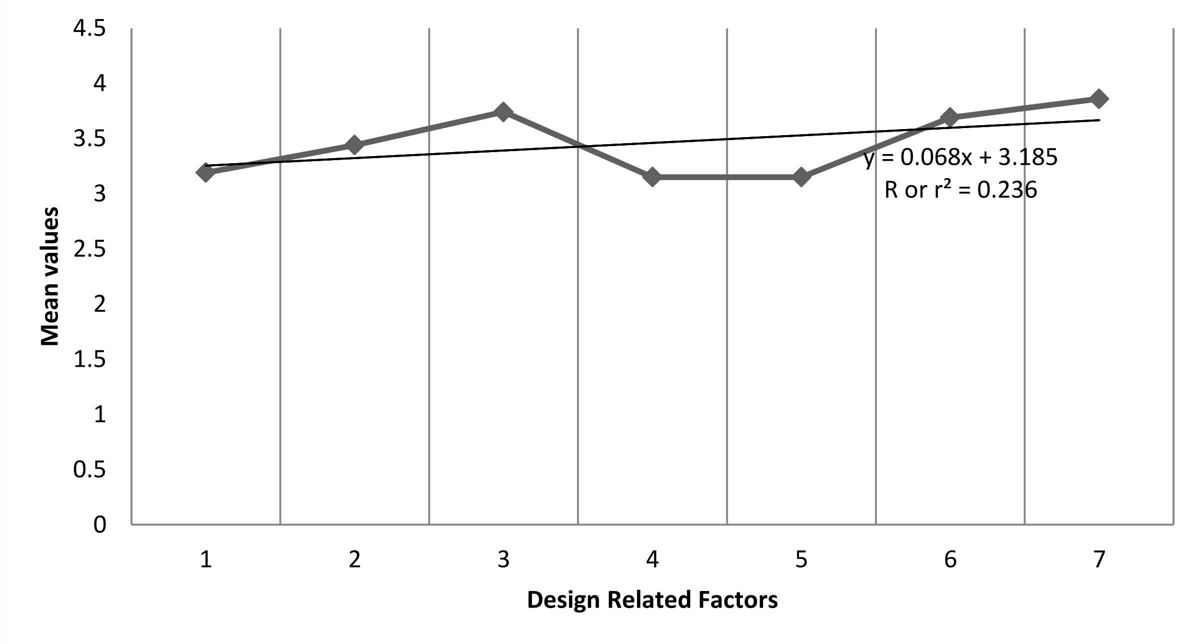

Figure 4: Mean values against Design Related Factors

In Figure 4, the graphical estimation shows that, Y = 0.068x + 3.185 and r^2 or R or r^2 = 0.236. The coefficient of correlation, $r = \sqrt{R} = \sqrt{0.236} = 0.4858$. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 12 from the Correlation coefficient table is 0.3646. This result shows that since the critical value of r = 0.3646 is less than the computed value of r = 0.4858, design related factors constraints one of the major constraint to sustainable engineering projects delivery in the state.

Table 7: Perception of Respondents on Constraint Factors associated with Technical and Technological Factors

S/N e.	Item Technical/Technological Factors	SD	DA	UD	A	SA	$\sum Fx$	mean	S.I . %	Rank
1.	Lack of accessible technology	47	114	35	94	54	1026	2.98	59.7	5th
2.	Lack of experienced workforce	–	101	82	122	39	1131	3.29	65.8	2nd
3.	Lack of exemplar project cases to draw learning	–	94	49	113	88	1227	3.57	71.3	1st
4.	Variability in design and contractor's knowledge	26	83	67	134	34	1099	3.19	63.9	4th
5.	Complex code and regulations	–	115	92	86	51	1105	3.21	64.2	3rd
							Grand Mean	**3.24**	**65.0**	

Source: Researcher Field Survey Report (2022)

The information in Table 7 indicates that, under the Technical and Technological constraint Factors, lack of exemplar project cases to draw knowledge was rated highest with mean score of 3.57 with severity index of 71.3%.Lack of accessible technology has the least mean score rating of 2.98 representing a severity index of 59.7% while variability in design and contractors' knowledge has a mean score of 3.19 with severity index of 63.9%.In all the five identified variables, the mean score rating on "complex code and regulations" was 3.21 with a severity index of 64.2%.The grand mean score rating of 3.25 and 65.0% for the severity index. Most of the mean score rating are below 3.25. This showed that only lack of exemplar project areas to draw knowledge is a main constraint factors. However, the grand mean scores still shows that technical and technological factors are constraints to sustainable projects delivery in Enugu State. On technical and technological factors lack of exemplar projects cases to draw knowledge that ranked first is evident because sustainable engineering projects is a new paradigm in construction which most construction experts are trying to adjust due to lack of experienced work force that ranked second also shows that many construction workers are yet to be experienced in this sustainable construction in the study area. Complex code and regulations variability in design and contractors knowledge and accessibility to the technology can be achieved but more to the practical knowledge for implementation.

The information in Table 7 was represented in the graph on Figure 5.

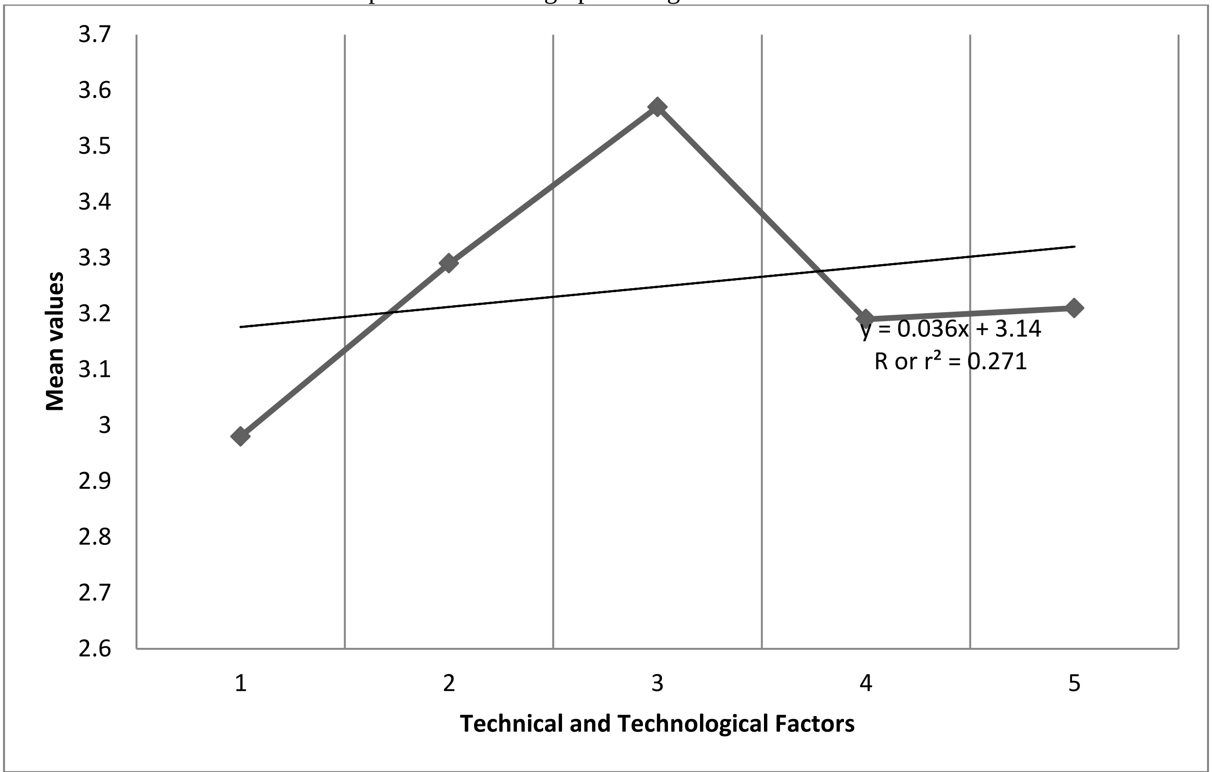

Figure 5: Mean values against Technical and Technological Factors

In Figure 5, the graphical estimation shows that, Y = 0.036x + 3.14 and R or r^2 = 0.271. The coefficient of correlation, r = $\sqrt{R} = \sqrt{0.271} = 0.5206$. The critical value of r at 0.1 level of significance and degree of freedom ($_f$) = 8 from the Correlation coefficient table is 0.4428. The result here also shows that since the critical value of the coefficient of correlation (r) = 0.4428 is less than the computed value of r = 0.5206, technical and technological factors was one of the major constraints to sustainable projects delivery in the study area.

Table 8: Perception of Respondents on Constraint Factors associated with Construction Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	Mean	S.I %	Rank
f.	**Construction Factors**									
1.	Poor quality of workmanship	62	53	65	131	95	1300	3.78	75.6	6th
2.	Change orders (variation in scope)	–	104	84	53	36	914	2.66	53.1	9th
3.	Efficiency of supervision	46	46	58	124	116	1342	3.90	78.0	3rd
4.	Lack of locally sourced sustainable materials	–	78	23	138	59	1118	3.25	65.0	8th
5.	Inexperienced contractor	–	97	86	118	83	1339	3.89	77.8	4th
6.	Poor budgetary/cost control	–	42	44	132	126	1374	3.99	79.9	2nd
7.	Scarcity and high cost of labour for sustainable construction	–	80	55	115	94	1255	3.65	73.0	7th

8.	High cost of sustainable construction materials	–	52	43	168	81	1310	3.81	76.2	5th
9.	High cost of sustainable materials and products	–	16	104	76	148	1388	4.03	80.7	1st
10.	Lack of awareness of alternative economic products	–	47	34	137	126	1374	3.99	79.9	2nd
							Grand Mean	**3.70**	**73.9**	

Source: Researcher Field Survey Report (2022)

The information in Table 8 indicates that, the highest mean score rating in construction factors associated with Constraint Factors to sustainable engineering projects delivery is 4.03 with a severity index of 80.7% which is high cost of sustainable materials and products. This is followed by lack of awareness of alternative economic products and poor budgetary/cost control which are second with mean score rating of 3.99 and severity index of 79.9%.The least mean score rating of change orders (variation in scope) is 2.66 with a severity index of 53.1%.The variable on item 2 in the table with mean score of 2.66 and severity index of 53.1% is below the minimum mean score of 3.25 and severity index of 65.0%, therefore is not regarded as one of the major constrain factor associated with construction factors to sustainable projects delivery in the area. The grand mean score rating of 3.70 with a severity index of 73.9% shows that constraint factors on construction factors are part of the main constraint factors to sustainable engineering projects delivery in Enugu State. All the variables below 3.25 mean score rating is not regarded as the major constraint factors to sustainable projects delivery. The constraint factors associates with construction factors show that the high cost of sustainable materials and products ranked first. This means that issue like high, exchange rates, inflation and other factors associated with sourcing of sustainable materials and products are constraints to sustainable projects delivery. Lack of awareness of alternative economic products and efficiency of supervision are also variables ranked high on construction factors. However, change orders (variation in scope) are rated low and are not a variable to construction constraint factors.

The information in Table 8 was represented in the graph on Figure 6.

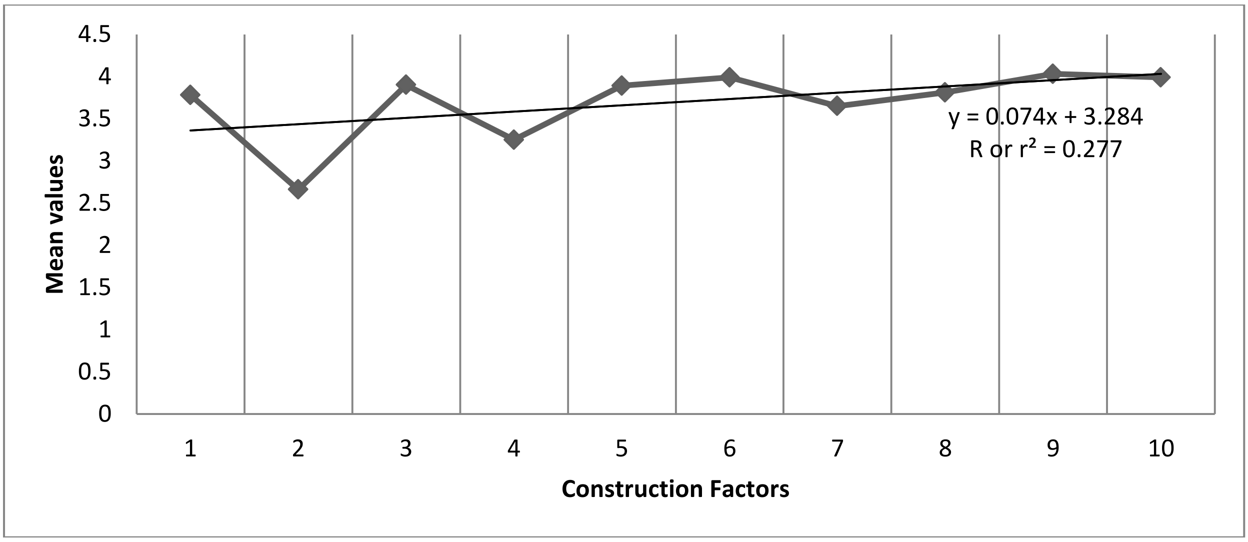

Figure 6: Mean values against Construction Factor

In Figure 6, the graphical estimation shows that, Y = 0.074x + 3.284 and R or r^2 = 0.277. The coefficient of correlation, r = $\sqrt{R}$ = $\sqrt{0.277}$ = 0.5263. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 18 from the Correlation coefficient table is 0.2992. The result also shows that since the critical value of the coefficient of correlation (r) = 0.2992 is less than the computed value of r = 0.5263 construction factors are major constraints to sustainable engineering projects delivery in the area.

Table 9: Perception of Respondents on Constraint Factors associated with Project Management Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	mean	S.I %	Rank
g.	**Project Management Factors**									
1.	Improper planning due to inexperience	–	82	46	148	68	1234	3.59	71.7	5th
2.	Unrealistic project goals	–	35	116	102	91	1281	3.72	74.5	4th
3.	Poor communication among project team members	–	37	68	121	118	1352	3.93	78.6	2nd
4.	Weak/unclear scoping of project goals/requirements	–	72	124	83	65	1173	3.40	68.2	6th
5.	Cost of charette (high cost team integration)	–	70	24	128	122	1334	3.88	77.6	3rd
6.	Insufficient time to research sustainable products	–	107	86	113	38	1114	3.24	64.8	7th
7.	Poor quality of construction documents	–	26	60	105	143	1367	3.97	79.5	1st
8.	Late inclusion of green goals in the project	–	87	108	131	18	1112	3.23	64.7	8th
	Grand Mean							**3.62**	**72.4**	

Source: Researcher Field Survey Report (2022)

The information in Table 9 indicates that, the highest mean score rating of 3.97 with a severity index of 79.5% is poor quality of construction documents followed by poor communication among project team members with mean score rating of 3.93 and a severity index of 78.6%.The least in the identified variables is late inclusion of green goals in the project with mean score rating of 3.23 and a severity index of 64.7%. The next to the least is "insufficient time to research sustainable products" with mean value of 3.24 and severity of 64.8%. Items 6 and 7 in the table are below the cut-off mean of 3.25 and severity index of 65.0%, therefore are not major constraint factors on project management factors to sustainable delivery in the state. The grand mean score rating of project management factor is 3.62 and a severity index of 72.4% which indicates that it is a major constraint factors to sustainable engineering projects delivery in the area. The poor quality of construction documents variable ranked first as constraints under project management factors and poor communication among project team members ranked second followed by cost of charette (high cost team integration) which suggests that for sustainable projects delivery to be accomplished, these variables should be properly addressed. Late inclusion of green goals ranked least is not a major constraint because it may not affect project management factors much.

The information in Table 9 was represented in the graph on Figure 7

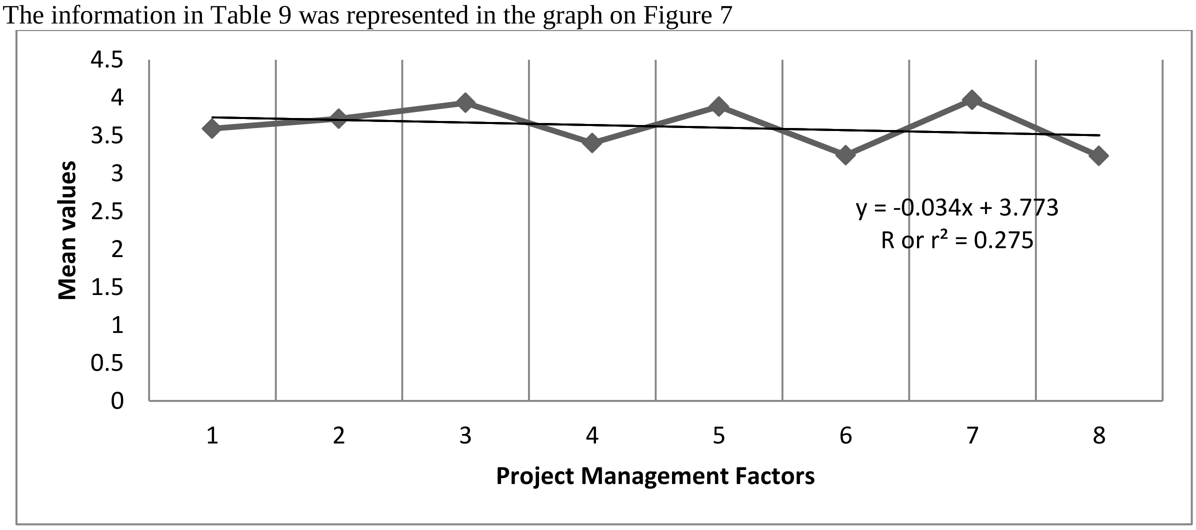

Figure 7: Mean values against Project Management Factors

In Figure 7, the graphical estimation shows that, Y= = -0.034x + 3.773 and R or r^2 = 0.275. The coefficient of correlation, r = $\sqrt{R}$ = $\sqrt{0.275}$ = 0.5244. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 14 from the Correlation coefficient table is 0.3383.The result shows that since critical value of the coefficient of correlation (r) = 0.3383 is less than the computed value of r = 0.5244, projects management factors are major constraints to sustainable projects delivery in the study area.

Table 10: Perception of Respondents on Constraint Factors associated with Procurement Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	mean	S.I. %	Rank
h.	**Procurement Factors**									
1.	Type of contract used	–	127	79	109	29	1072	3.12	62.3	6th
2.	Lack of incentives in contrasts to stimulate innovation	–	29	94	125	96	1320	3.84	76.7	3rd
3.	Fragmented project development approach	–	114	38	132	60	1170	3.40	68.0	5th
4.	Lack of integrated approach to project delivery	–	42	52	106	144	1384	4.02	80.5	1st
5.	Focus on price based selection criteria	–	28	59	134	123	1384	4.02	80.5	1st
6.	Lack of integration in procurement approach	–	59	63	118	104	1299	3.78	75.5	4th
7.	Limited information disclosure in contractual chain	–	36	68	124	116	1352	3.93	78.6	2nd
	Grand Mean							**3.73**	**74.6**	

Source: Researcher Field Survey Report (2022)

The information in Table 10 indicates that, "Lack of integrated approach to project delivery and focus in price-based selection criteria" are major constraint factors with mean score rating of 4.02 and a severity index of 80.5% each. Least in the identified variables is the "Type of contract used" with a mean score rating of 3.12 and a severity index of 62.3%. The mean score on item 1 in the table is not a major constraint factor variable under procurement factors because it is below the minimum mean value of 3.25 and severity index of 65.0%. The grand mean score of 3.73 and a severity index of 74.6% indicate that most procurement factors variables identified are constraint factors to sustainable engineering projects delivery in the Enugu State. Focus on price based selection criteria and lack of integrated approach to project delivery ranked first as the variables in procurement factors followed by limited information disclosure in contractual claim and lack of incentives in contrasts to stimulate innovation. These constraints variables must be addressed under procurement factors for sustainable building projects delivery to be achieved in the study area.

The information in Table 10 was represented in the graph on Figure 8.

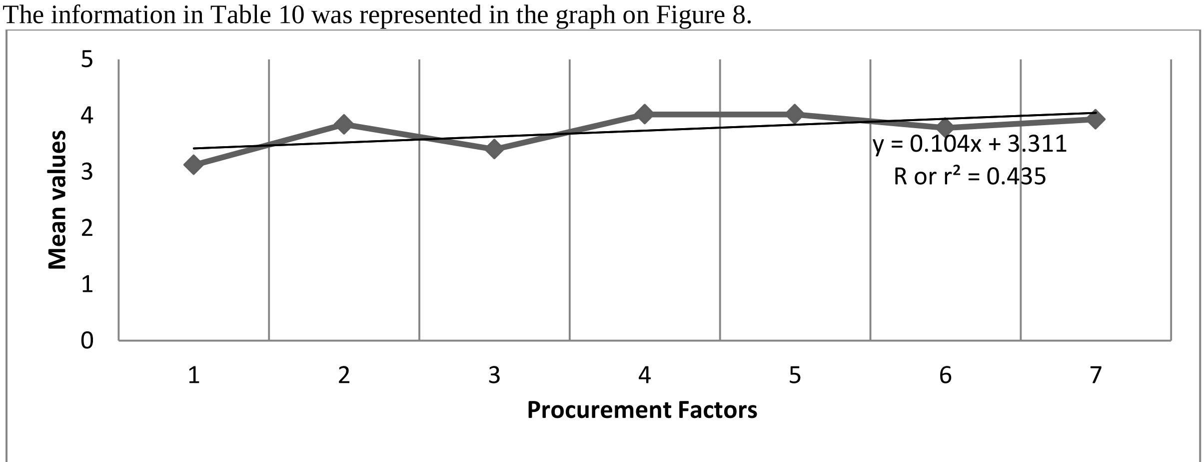

Figure 8: Mean values against Procurement Factors

In Figure 8, the graphical estimation shows that, Y= 0.104x + 3.311 and R or r^2 = 0.435.The coefficient of correlation, r = $\sqrt{R}$ = $\sqrt{0.435}$ = 0.6595. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 12 from the Correlation coefficient table is 0.3646. The result shows that since the critical value of the coefficient of correlation (r) = 0.3646 is less than the computed value of r =0.6595, procurement factors are major constraints to sustainable engineering projects delivery in Enugu State.

Table 11: Perception of Respondents on Constraint Factors associated with Site Related Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	Mean	S.I %	Rank
i.	**Site Related Factors**									
1.	Cost and location of site relative to public access	–	57	38	135	114	1338	3.89	77.8	1st
2.	Development in brown-field (added remediation cost)	–	–	85	112	105	1228	3.57	71.4	3rd
3.	Site characteristics, local climate and conditions	–	89	101	56	32	931	2.71	54.1	4th
4.	External stakeholders influence in the project environment	–	49	77	106	112	1313	3.82	76.3	2nd
							Grand Mean	**3.50**	**70.0**	

Source: Researcher Field Survey Report (2022)

The information in Table 11 indicates that, "Cost and location of site relative to public access" with mean score rating of 3.89 and severity index of 77.8% is highest identified variable under site related factors. Site characteristics, local climate and conditions have the least mean score rating of 2.71 and a severity index of 54.1%. This means that this variable is not a major constraint factor on site related factors variable because it is below mean value of 3.25 and severity index of 65.0%. The grand mean score of 3.50with a severity index of 70.0% indicated that site related factors are part of the main identified constraint factors to sustainable projects delivery in Enugu State. Cost and location of site relative to public access was ranked first followed by external stakeholders influence in the project environment and development of brown-field (added remediation costs) is constraints under site related factors. These and other variables as ranked should be properly addressed in order to achieve sustainable engineering projects delivery in Enugu State.

The information in Table 11 was represented in the graph on Figure 9.

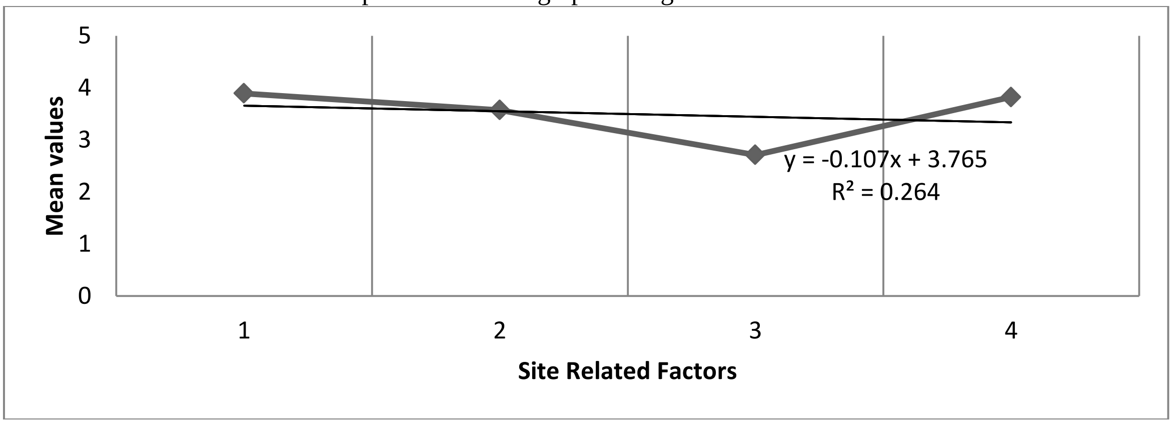

Figure 9: Mean values against Site Related Factors

In Figure 9, the graphical estimation shows that, Y = -0.107x + 3.765 and R or r^2 = 0.264.The coefficient of correlation, r = $\sqrt{R}$ = $\sqrt{0.264}$ = 0.5138. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 6 from the Correlation coefficient table is 0.5067.The result shows that since the critical value of the coefficient of correlation (r) = 0.5067 is less than the computed value of r = 0.5138, site related factors are major constraints to sustainable engineering projects delivery in the study area.

Table 12: Perception of Respondents on Constraint Factors associated with Criteria Cost Risk Factors

S/N	Item	SD	DA	UD	A	SA	$\sum Fx$	Mean	S.I %	Rank
j.	**Criteria cost Risk Factors**									
1.	Unrealistic project goals	–	131	46	107	60	1128	3.28	65.6	4th
2.	Unreliable and experimental construction method/materials	–	142	54	78	70	1108	3.22	64.4	5th
3.	Uncertainty over costs of development	–	–	83	128	133	1426	4.15	82.9	1st
4.	Uncertainty about economic benefits	–	50	56	136	102	1322	3.84	76.9	3rd
5.	Uncertainty over project performance	–	6	95	116	127	1396	4.06	81.2	2nd
Grand Mean								**3.71**	**74.2**	

Source: Researcher Field Survey Report (2022)

The information in Table 12 indicates that, "Uncertainty over cost of development" with mean score rating of 4.15 and severity index of 82.9% is the highest identified variable under Criteria Cost Risk Factors. The next in the rating is "uncertainty over project performance" with mean score rating of 4.06 and severity index of 81.2%.Unreliable and experimental construction method/materials have the least mean score rating of 3.22 and severity index of 64.4%.This factor variable is below the minimum mean value of 3.25 and severity index of 65.0%. Therefore it is not considered as a major constraint factor on criteria cost related factors. The grand mean score rating of 3.71 with severity index of 74.2% indicates that the Criteria Cost Risk Factors are also major constraint factors to sustainable engineering project delivery in Enugu State. Uncertainty over costs of development, ranked first followed by uncertainty over project performance and uncertainty about economic benefits were variables rated high on criteria cost risk factors. The least in the ranking was unreliable and experimental construction methods/materials which suggest that it is not a major constraint on sustainable projects delivery in the study area.

The information in Table 12 was represented in the graph on Figure 10.

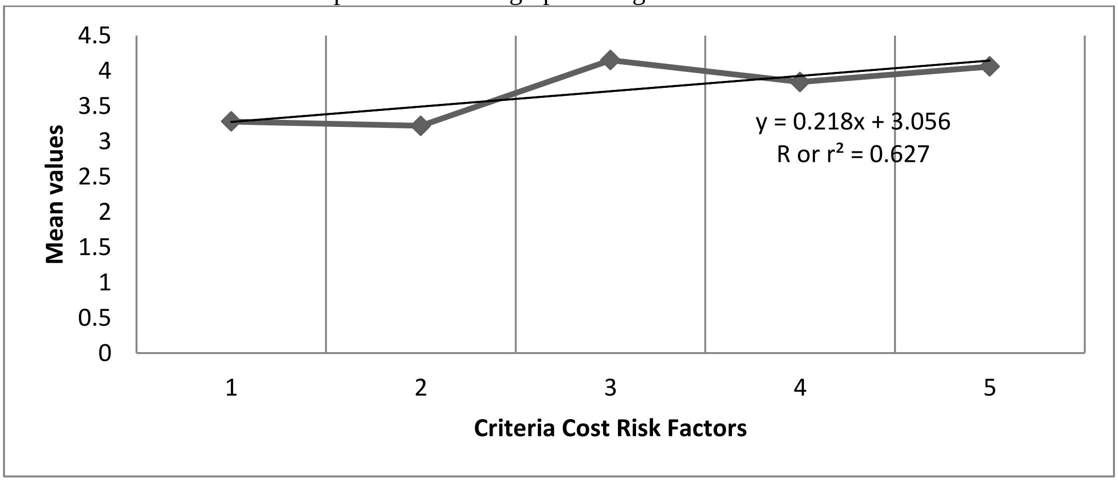

Figure 10: Mean values against Criteria Cost Risk Factors

In Figure 10, the graphical estimation shows that, Y = 0.218x + 3.056 and r^2 or R = 0.627. The coefficient of correlation, r = $\sqrt{R} = \sqrt{0.627}$ = 0.7918. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 8 from the Correlation coefficient table is 0.4428.The result shows that since critical value of the coefficient of correlation (r) = 0.4428 is less than the computed value of r = 07918, criteria cost risk factors are major constraints to sustainable projects delivery in the study area.

Table 13: Respondents' Responses on Constraint Factors associated with Perception Factors

S/N	**Item**	**SD**	**DA**	**UD**	**A**	**SA**	$\sum Fx$	**Mean**	**S.I %**	**Rank**
k.	**Perception Factors**									
1.	Inability to let-off historical costs	–	133	45	122	44	1109	3.22	64.5	4th
2.	Lack of awareness that cost are reducing	–	67	40	112	125	1327	3.86	77.2	1st
3.	Over reliance on the costs of exemplar projects	–	68	52	128	96	1284	3.73	74.7	2nd
4.	Inflation of exact costs of sustainable building of the projects	–	126	58	103	57	1123	3.26	65.3	3rd
							Grand Mean	**3.52**	**70.4**	

Source: Researcher Field Survey Report (2022)

The information in Table 13 indicates that, Lack of awareness that cost are reducing has the highest mean score rating of 3.86 with severity index of 77.2% on perception factors. The next in mean score rating of 3.73 with severity index of 74.7% is over reliance on the cost of exemplar projects. Inability to let-off historical costs with mean score rating of 3.22 and severity index of 64.5% has the least mean score rating under perception factors. This constraint factor on perception factors variable is not considered as a major constraint faction since it is below the mean of 3.25 and severity index of 65.0%. The grand mean score rating of 3.52 with severity index of 70.4% indicated that perception factors are also one of the main constraint factors to sustainable engineering project delivery in Enugu State. Lack of awareness that cost are reducing followed by over reliance on the costs of exemplar projects and inflation of exact costs of sustainable projects are highly rated variables to constraint sustainable engineering projects delivery in the study area. These are perception factors which vary with the idiosyncrasy of the individuals.

The information in Table 13 was represented in the graph on Figure 11.

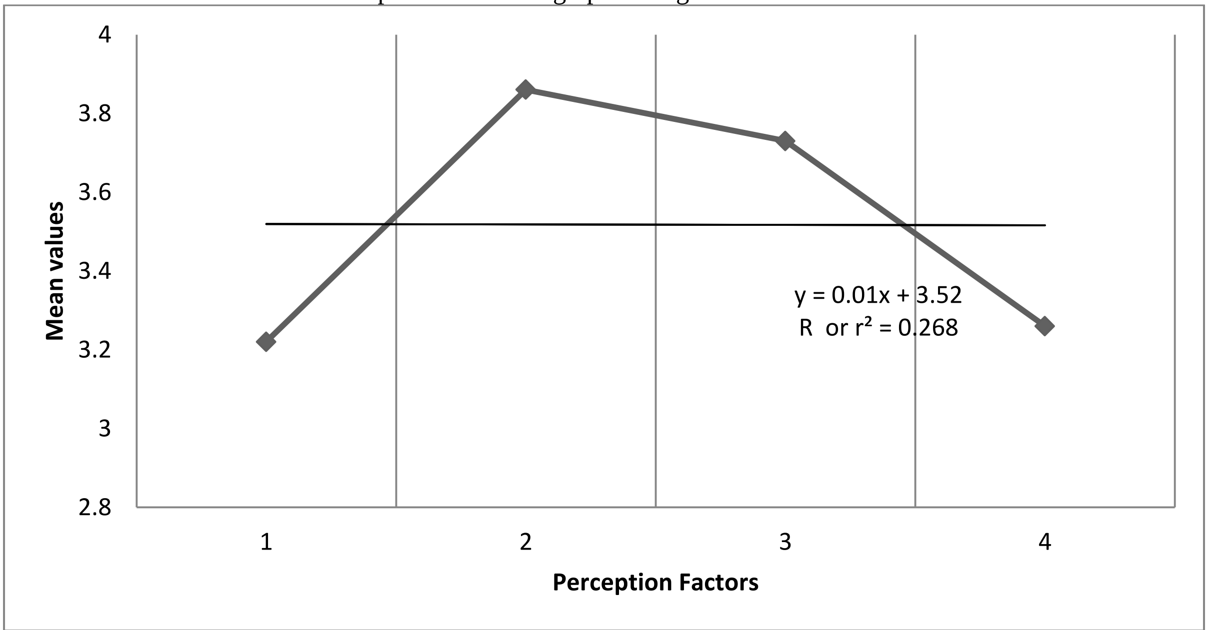

Figure 11: Mean values against Perception Factors

In Figure 11, the graphical estimation shows that, Y= 0.01x + 3.52 and R or $r^2 = 0.268$. The coefficient of correlation, $r = \sqrt{R} = \sqrt{0.268} = 0.5177$. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 6 from the Correlation coefficient table is 0.5067. The result shows that since critical value of the coefficient of correlation (r) = 0.5067 is less than the computed value of r = 0.5177, perception factors are major constraints to sustainable building projects delivery in the state.

Table 14: Perception of Respondents on Constraint Factors associated with Process and Regulatory Factors

S/N	**Item**	**SD**	**DA**	**UD**	**A**	**SA**	$\sum Fx$	**Mean**	**S.I %**	**Rank**
l.	**Process and Regulatory Factors**									
1.	Tax on sustainable products	–	103	62	97	82	1190	3.46	69.2	5th
2.	Expensive planning fees	–	56	28	110	120	1296	3.77	75.3	4th
3.	Processing delays	–	82	73	115	134	1393	4.05	81.0	1st
4.	Resistant by pressure groups	14	68	49	70	43	892	2.59	51.9	6th
5.	Lack of political will	–	33	86	127	98	1322	3.84	76.9	2nd
6.	Inhibitive public policy and regulation	–	44	82	124	94	1300	3.78	75.6	3rd
							Grand Mean	**3.58**	**71.6**	

Source: Researcher Field Survey Report (2022)

The information in Table 14 indicates that, the variables of processing delays with mean score rating of 4.05 and severity index of 81.0% is the highest under Process and Regulatory Factors. This is followed by lack of political will amongst the policy makers with mean score rating of 3.84 and severity index of 76.9%.The resistant by pressure groups with mean score rating of 2.59 and severity index of 51.9% has the least rating under Process and Regulatory Factors identified variables. This means that this is not a major constraint on process and regulatory factor variable. The grand mean score rating of 3.58 and severity index of 71.6% indicates that Process and Regulatory Factors are one of the major constraint factors to sustainable building project delivery in Enugu State. Under incentive factors, lack of incentives (easy access to loan facilities, subsides and planning rebates) with mean score rating of 4.05 and severity index of 81.0% is one of the identified constraint factors to sustainable building project delivery in Enugu State. Processing delays followed by lack of political will and inhibitive public policy and regulations are the first three in the ranking for process and regularly factors. These have been identified as some of the constraints that need to be addressed for sustainable building projects delivery in the state to be achieved. Also expensive planning fees, tax on sustainable products and resistant by pressure groups constitute hindrance to building projects delivery in the study area.

The information in Table 14 was represented in the graph on Figure 12.

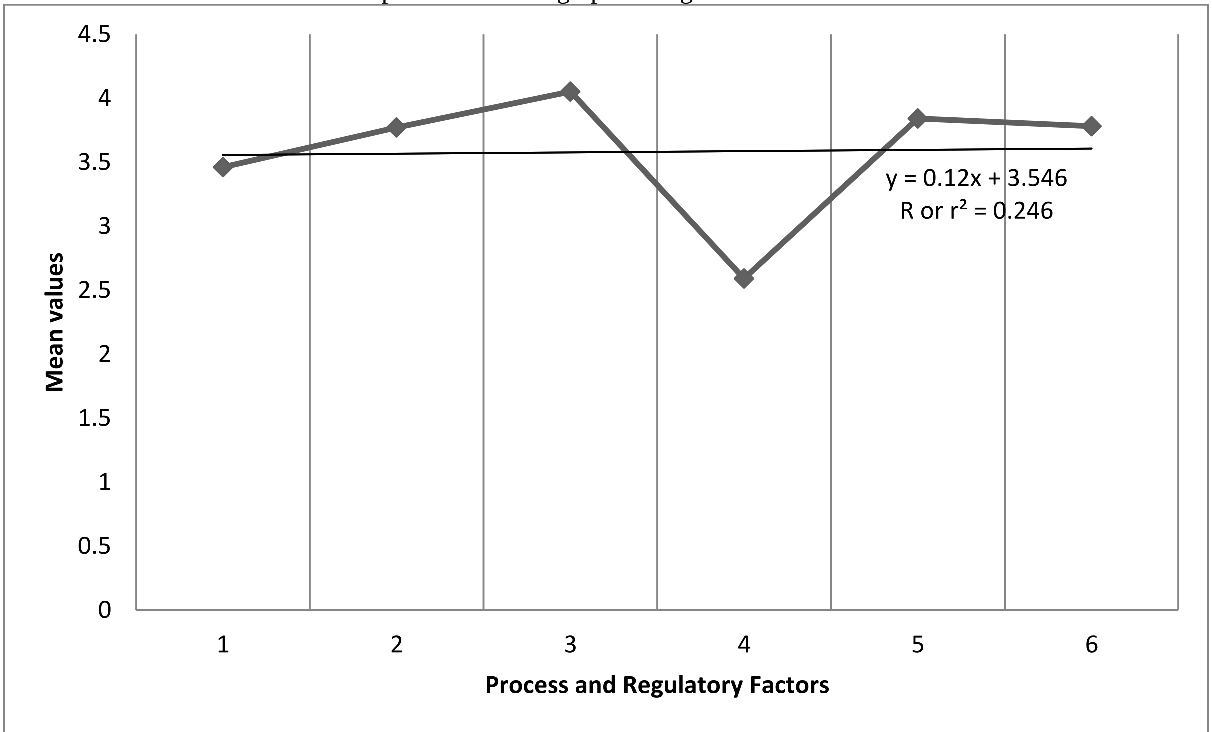

Figure 12: Mean values against Process and Regulatory Factors

In Figure 12, the graphical estimation shows that, Y= 0.12x + 3.546 and R or r^2 = 0.246. The coefficient of correlation, r = $\sqrt{R} = \sqrt{0.246} = 0.4960$. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 10 from the Correlation coefficient table is 0.3981. The result shows that since critical value of the coefficient of correlation (r) = 0.3981 is less than the computed value of r = 0.4960, process and regulatory factors are major constraints to sustainable building projects delivery in Enugu State, Nigeria.

This study identified the constraint factors to sustainable building projects delivery in the study area. These include the Economic factors; Education, training, skills and knowledge gap; Project factors; Design related factors; Technical and Technological Factors; Construction factors; Site Related Factors; Criteria Cost Risk Factors; Perception Factors; Process and Regulatory Factors; and Incentive Factors. The constraints were identified and discussed in table 15 from the responses of respondents as stated in the questionnaires.

Table 15: Summary of Perception of Respondents on identified constraint factors, mean score rating and severity index to sustainable building project delivery in Enugu State.

S/N	Identified constraint factors	Grand mean score	Severity index (%)	Rank
A	Economic factors	4.02	80.4	2nd
B	Education training skills and knowledge gap	3.92	78.4	4th
C	Project factors	4.00	80.0	3rd
D	Design related factors	3.46	69.2	12th
E	Technical and Technological Factors	3.25	65.0	13th
F	Construction factors	3.70	73.9	7th
G	Project management factors	3.62	72.4	8th
H	Procurement factors	3.73	74.6	5th
I	Site Related Factors	3.50	70.0	11th
J	Criteria Cost Risk Factors	3.71	74.2	6th
K	Perception Factors	3.52	70.4	10th
L	Process and Regulatory Factors	3.58	71.6	9th
M	Incentive Factors	4.05	81.0	1st
	Overall Grand Mean Score	**3.70**	**73.9**	

Source: Researcher Field Survey Report (2022)

The information in table 15 indicates that among the identified constraint factors, incentive factors ranked first with grand mean score of 4.05 and severity index of 81.0%, this is followed by economic factors with grand mean of 4.02 and severity index of 80.4%. The third in the ranking is project factors with grand mean of 4.00 and severity index of 80.0%. The least is the technical and technological factors constraints with grand mean of 3.25 and severity index of 65.0%. In all the identified constraint factors, none was below the mean value of 3.25 and severity index of 65.0%. Therefore, all these identified factors are constraints to sustainable engineering project delivery in Enugu State. The identified constraint factor variables of incentive factors ranked first and observation is that for sustainable projects delivery to be achieved incentive will play pioneering roles since the concept of sustainability is alien to the construction workers in the area. Lack of incentive will discourage project workers which is a major constraint. Economic factors that ranked second shows that major constraints like affordability, high cost of sustainable products, inflation and interest charges on loan facilities will hinder sustainable projects delivery. Technical and technological factors variables may not be major constraints because accessible technology, experience workforce and others cannot impede sustainable building of projects delivery. There is a need for the policy makers and stakeholders to be orientated on the need to achieve sustainable engineering dream goals in the study area.

The above information in Table 15 was plotted on a graph of Grand Mean Score against the identified constraint factors from items (a) to (m) in figure 13.

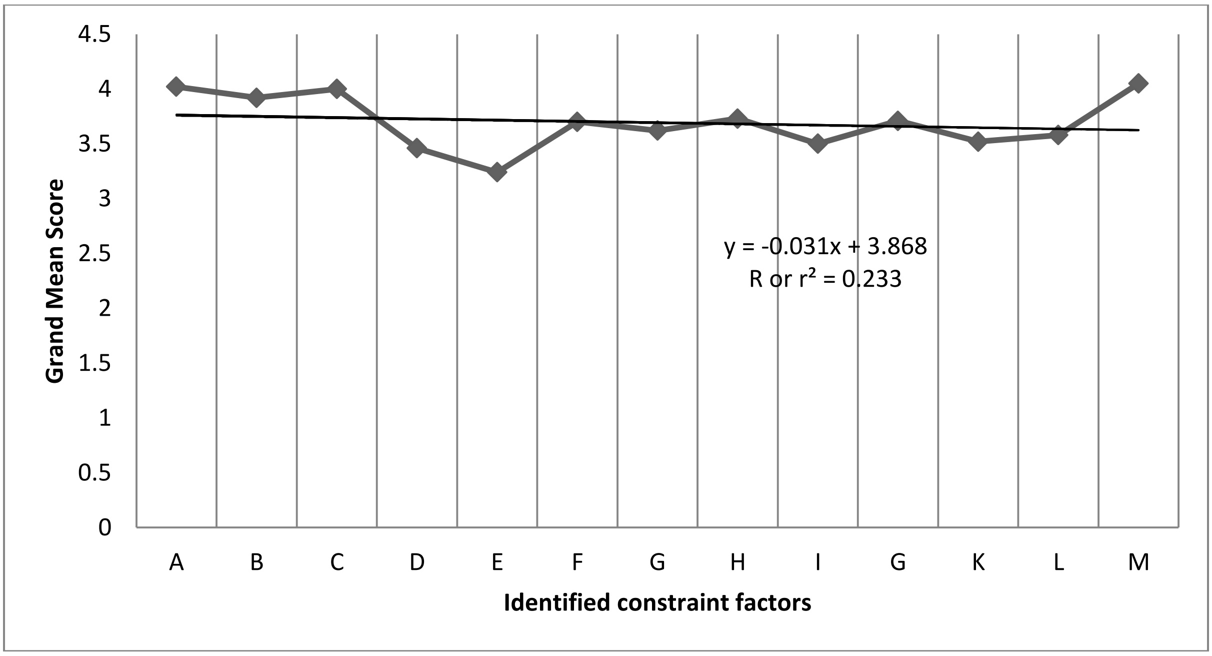

Figure 13: Grand Mean Score against the identified constraint factors

In Figure 13, the graph of the regression function of Grand Mean Score against the identified constraint factors to sustainable building projects delivery is a linear relationship which showed that the line of best fit at Y= 0.031x + 3.868.The estimation of the graphical function for the coefficient of determination (R or r^2) = 0.233.The coefficient of correlation (r) = $\sqrt{R} = \sqrt{0.233}$ = 0.4827. The results show that of the total variation in the values of mean score ratings is explained by the variation in the identified constraint factors variables. The critical value of r at 0.1 level of significance and degree of freedom (d_f) = 24 is 0.2598.The result shows that since critical value of the coefficient of correlation (r) = 0.2598 is less than the computed value of r = 0.4827, all the identified constraint factors affect sustainable projects delivery in Enugu State.

The perception of respondents on identified constraint factors to sustainable project delivery as stated in table 15 shows that incentive factors ranked first followed by economic factors; project factors; and education, training, skills and knowledge gap. The least in the ranking is technical and technological factors. This shows that for sustainable engineering projects to be successful, incentives to project participants is paramount. Technical and technological factors are prioritized least because they can always be applied to all types of projects.

V. CONCLUSION AND RECOMMENDATION

Based on the findings, the following conclusion and recommendations were drawn:

i. Conserving the earth's natural, physical and chemical system with integration of meeting current and long term human needs will be difficult without proper articulated development strategy.

ii. The absence of professional Engineers' input in most construction sites in Enugu State, lack of integrity and unethical practices on the part of some stakeholders involved in approval and monitoring the implementation of development projects should be properly addressed for sustainable projects delivery.

iii. There is need for synergy with the policy makers, political administrators, the built environment professionals and consultants both in public and private sectors, estate developers, manufacturers and importers of building materials, building owners, building users/occupants and associated interest groups to mitigate the identified constraint factors.

iv. The government should develop a template for sustainable engineering projects delivery to incorporate mitigation measures for the constraints to sustainable projects at pre-contract and post-contract stages by making it obligatory to use the framework developed for sustainable building projects delivery in the state.

v. There is need for capacity building through education, training, skill and knowledge gap for sustainability integration of the identified constraints factors.

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