

INCORPORATING ENVIRONMENTAL SUSTAINABILITY INTO CONSTRUCTION PROCUREMENT AT THE DISTRICT ASSEMBLY LEVEL IN GHANA

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Construction projects account for high carbon emissions, high water consumption, high amount of landfill waste and high usage of raw materials. By incorporating environmental sustainability into construction procurement in the public sector it would be possible to reduce the corresponding effects on the environment. The study aimed at exploring the driving factors of environmental sustainability into construction procurement at the district assembly level in the western region of Ghana. Census sampling technique was combined with purposive sampling to identify the four categories of respondents from the twenty-two (22) district assemblies used for the study. Related literature on construction procurement and factors driving environmental sustainability issues were reviewed, questionnaires was used as the data collection instrument for the study. Four major factors namely: leadership influence, environmental culture, public influence and personal skills were identified as driving environmental sustainability into construction procurement at the district assembly level in Ghana. The study concluded that environmental officers are to be made part of the construction procurement team as they have the expertise knowledge in environmental laws and environmental impacts such as forest degradation, water pollution, farm land destruction, and air pollution at the various districts. The study highlighted issues, requirements and responsibilities necessary to promote more responsive environmental outcomes from construction projects.

Keywords: district assembly, environmental sustainability, Ghana, procurement

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INTRODUCTION

There is increasing onus on public organizations in society to minimize impacts of their activities upon the environment in most countries (Strandberg, 2002; McWilliams and Siegel, 2000). Governments around the world have been urged to take the lead in introducing environmentally sustainable practices in their own operations, in particular through procurement policies (United Nations, 1999; European commission 2011). This is due to the fact that construction activities, especially buildings embarked on by public organizations contribute to environmental degradation in various ways such as resource depletion, energy consumption, air pollution, waste creation, etc. (Opintan-Baah et al., 2011; Ayarkwa et al., 2010; Chavan, 2005). Worldwide, buildings account for 20% fresh water consumption, 25% wood harvest, 40% CO² emissions, 40% energy use and 30% raw material use (Seneviratne, 2011). Ayarkwa et al., (2010) found that the consumption of raw materials from the construction industry leads to major environmental degradation because the consumptions are non-renewable. According to Ofori (2000), construction contributes to the loss of forests because the raw materials are consumed and irreversibly converted to timber or other raw materials for construction activities; wild or agricultural lands are changed because of urbanization or other development projects mostly embarked on by the government. Many recent researchers have identified procurement as a major tool to augment governments' environmental protection efforts, but, it is apparent that none of the major studies in Ghana have identified factors driving environmental sustainability into the construction procurement at the district assembly level (Adetunji et al., 2008). Interestingly, the study conducted by Adetunji et al. (2008) revealed that government procurement practices have largely been focused on price, whereas the commitment to environmental sustainability has been an act of faith rather than a contractual deliverable (Poon et al., 2004). Varnas et al. (2009) revealed that environmental criteria in tender evaluations are less common and seldom affect the award decisions. Furthermore, Jaillon et al. (2009) revealed that the construction industry pays less attention to environmental issues than other issues such as construction cost, construction time, familiarity with the construction technology, and availability of resources. Boyefio (2008), identified efforts by Ghana's Public Procurement Authority to address sustainability in public procurement. This study therefore aimed at identifying the factors driving the incorporation of environmental sustainability into construction procurement at the district assembly level. The district assemblies in the Western Region of Ghana was selected because the region is known to have crucial environmental concerns such as large and small scale mining, deforestation, coastal erosion and sanitation, urban sanitation, water hyacinth/ marine pollution (Adjarko et al., 2014). The study finally proposed ways of incorporating environmental sustainability issues into construction procurement at the various districts in Ghana.

STUDY AREA

The Western Region covers about 10 per cent of Ghana's total land surface. Occupying an area of 23,921 square kilometres, it is located in the South-Western part of Ghana, bordered by Ivory Coast on the West, Central Region on the East, Ashanti and Brong-Ahafo Regions on the North and on the South by 192 km of coastline of the Atlantic Ocean. The southernmost part, also the southernmost part of Ghana is called Cape Three Points, near Busua. There are 410,142 households in 259,874 houses, which give an average of 1.6 households per house for the region (Ghana Statistical Service, 2012). Most were built in the cocoa and timber economic boom years of the late 1950s and early 1960s. There is congestion in many houses which has resulted in the construction of new buildings at areas that served as agricultural lands and other purposes. There is the need for measures to reduce the effect of these growing construction activities on the environment. Figure 2.1 illustrates the map of the study area.

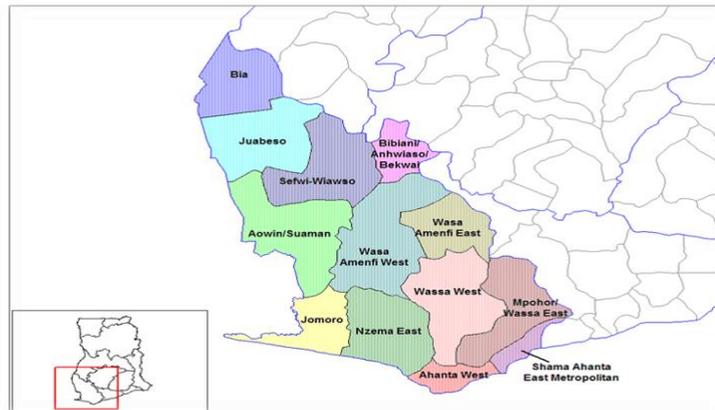


Figure 2. 1 Map of Study Area (Western Region)

The key environmental concerns in the western region include: Impacts of large and small scale mining, Deforestation, Industrial pollution (disposal of solid waste, effluent discharges and gaseous emissions), Coastal erosion and sanitation, Urban sanitation, and Water hyacinth/ marine pollution. The Western Region was selected based on these growing environmental concerns. These environmental concerns arising from construction activities could be curtailed by incorporating environmental sustainability into construction procurement in the various districts. Respondents were selected from the Sekondi-Takoradi Metropolis, Tarkwa Municipal, Nzema East Municipal, and Sehwi Wiaso Municipal including 18 other districts in the Western Region of Ghana.

PREVIOUS RESEARCH

Public Procurement of works in the Ghanaian Context

In the year 1996, the Government launched the Public Financial Management Reform Programme (PUFMARP) to improve overall public financial management in Ghana (Adu, 2011). The Public Financial Management Reform Programme (PUFMARP) identified weaknesses in the procurement system which includes: no comprehensive public procurement policy, etc (Adu, 2011). This led to the establishment of the Procurement Oversight Group in 1999 to steer the design of a comprehensive public procurement reform programme. A drafted public procurement bill was produced in September 2002. The Public Procurement Act, 2003 was passed into law on 31 December 2003 (Adu, 2011). This has been the legal document governing procurement of works at the district level in Ghana. The Public Procurement Act, 2003 (Act 663) establishes the Public Procurement Authority, Tender Committees and Tender Review Boards. It Specifies rules for procurement methods, and also defines offences and applicable penalties.

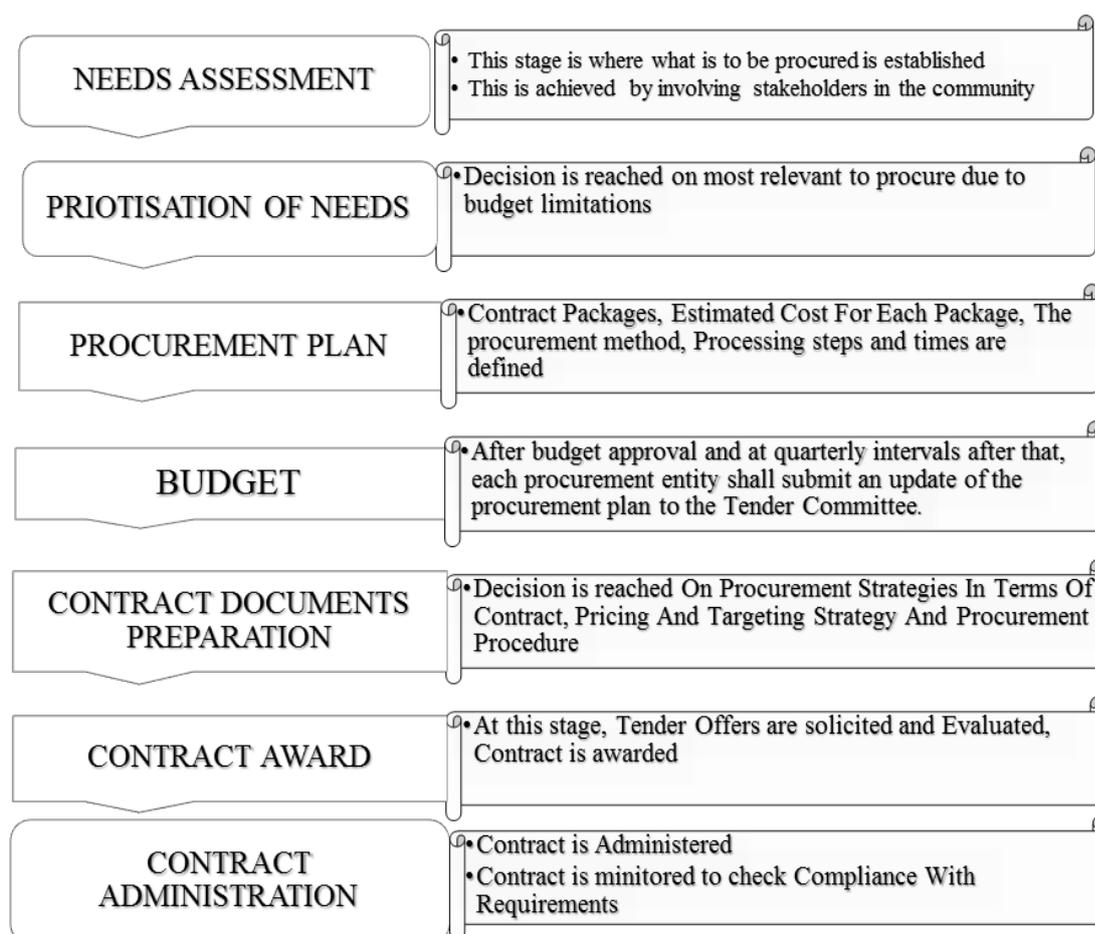


Figure 2.1 Construction Procurement Process at the district level
 Source: Adapted from the Public Procurement Manual (2003) of Act 663

Public Procurement Regulations is issued by the Minister for Finance in consultation with PPA under section 97 of the Act and contain detailed rules and procedures for all aspects of the procurement system such as the operations of PPA and procurement entities and the conduct of procurement activities. The Guidelines are issued by PPA under the Act and provide supplementary guidance on specific topics e.g. disposal, single source procurement and margins of preference. The standard Tender Documents is issued by PPA and are listed in Schedule 4 of the Act. Separate documents for Standard Invitation and contract documents for procurement of goods, works and services are provided (Adu, 2011). According to the Public Procurement Manual (2003) of Act 663, “Works” means work associated with the construction, reconstruction, demolition, repair or renovation of a building or structure or surface and includes site preparation, excavation, erection, assembly, installation of plant, fixing of equipment and laying out of materials, decoration and finishing, and any incidental activity under a procurement contract. Construction procurement is however not confined to construction works. Construction procurement includes services, goods, construction works and disposals in the form of demolitions and the disposal of surplus materials, plant and equipment (International Organization for Standardization, 2010). The process for construction procurement at the district assembly follows the process outlined in the Public Procurement Act. In the current tender documents, there are no provisions for environmental sustainability to be incorporated; there are no competitive clauses to discuss with the contractors, making it difficult for the client to enforce what district perceives as valuable. Figure 2.1 below shows the basic procedure for construction procurement at the district level in Ghana.

Environmental Responsibilities at the District Assembly Level in Ghana

The Constitution of the Republic of Ghana (1992) requires all citizens of Ghana to protect and safeguard the environment as stipulated in chapter six, article 41 (k). Also the Environmental Protection Agency Act (Act 490) mandates the Environmental Protection Agency to ad infinitum improve and preserve the countries environment (Yeboah and Mensah, 2014). Again the constitution grants the District Assemblies the highest political authority in the district, and that the District Assembly has deliberative, legislative and executive powers. The Local Government Act No. 462 of 1993 and the National Development Planning (System) Act 480 of 1994 are some of the main legislative texts pertaining to District Assemblies. The Assemblies have an executive committee, which is headed by a District Chief Executive who is appointed by the President. The District Chief Executive has significant authority over the affairs of the Assembly. Community Environmental Management Committees are set up and undergo training under the Ghana Environmental Management Project (GEMP) which was initiated in 2008 and funded by the Canadian International Development Agency (CIDA). The District Planning officer is the team leader of the District Environmental Management Committee. Members of the District Environmental Management team are the

National Disaster Management Committee (NADMO), the Environmental Health and Sanitation Unit, District Community Development Officer, the Ghana Education Service (GES), the Department of Social Welfare, the Gender Desk office, the representatives of traditional rulers, the Town and Country Planning, and the Police Force, most of whom are given further training. The Environmental Management Committee respond to reports of activities that degrade the environment (Agyekwena, 2014). The Local Government Act of 1993 prescribes to the District Assemblies broad mandates. The District Assemblies deliver many services, such as pre- and primary education, social welfare, health clinics, cemeteries, museums and libraries, water and sanitation, refuse collection, environmental protection and transport, and many of these have environmental impacts (Farvacque et al., 2008). The district assemblies together with district environmental management committees are responsible for local management of the environment.

Drivers to the Incorporation of Environmental Sustainability into Construction Procurement

The following drivers to the incorporation of environmental sustainability into procurement management were identified from literature and are discussed below:

Skilful policy entrepreneurs, Personal commitment, Extension of Founder's Value, Values of Owner, and Desire to Improve Position: In order to incorporate environmental sustainability into construction procurement, it is believed that the personal skills and commitment of the procurement officer play key roles (Walker et al., 2008). Wycherley (1999) found that the personal and ethical values of the founder of the company could filter through the organisation. At the district assembly level, the District Chief Executive representing government should have passion for the environment and find ways to promote environmental protection in their districts (Wycherley, 1999).

Desire to reduce costs, improve quality, desire to reduce risk of consumer criticism, pressure from investors, and desire to manage economic risk: The desire to reduce costs represents a common driving force for environmental considerations in projects (Walker et al., 2008). Costs can be prevented by embracing the concept of pollution prevention (Walker et al., 2008). There is need to find out whether it is same in the construction sector in Ghana.

Legislative and Regulatory compliance and ISO 14000 certification: According to Walker et al. (2008), government regulation and legislation appears to be a strong driver for environmental projects. Companies that have the ISO certification appear to have improved environmental performance (Ayarkwa et al., 2008). Environmental regulations promote the reduction of environmental impact at low cost compared to cost of litigation. Since these regulations govern all procurement activities in the public sector, their availability may be key to the promotion of environmental sustainability.

Investor pressure, Pressure from customers, Public pressure, Non-economic Stakeholders and Pressure by Environmental Advocacy Groups: According to Green et al. (1996), increased customer pressure and investor pressure may be enough to drive environmental sustainable practices into the procurement process. Projects from donor supported funds perform better environmentally due to pressures from the donors (Trowbridge, 2001). Stakeholder groups as well as Non-organisational stakeholders can pressure public organisations which have a much bigger purse to address environmental concerns (Hall, 2001). The voices of activist campaigners, non-governmental organisations (NGOs) or green pressure groups cannot be ignored anymore, as they have the ability to seriously embarrass non-compliant organisations (Gabriel et al., 2000).

Gaining competitive advantage, Potential for receiving publicity: According to Gonzalez-Benito and Gonzalez-Benito (2005), a policy of environmental purchasing may not be undertaken because of a desire to protect world's resources, but to gain competitive advantage and improve the financial performance of the institution. Since the districts are known to compete for resources, an improved environmental performance may be an advantage. The deterioration of the environment over recent years has drastically increased public awareness of environmental sustainability.

RESEARCH METHOD

The study implored exploratory research methods. Purposive sampling was used to identify the population for the study namely: procurement officials, environmental officers, quantity surveyors, and the district engineer. The inclusion of these officers helped the researcher to know the relevant environmental problems that could be solved through the procurement process and helped in bringing out the driving factors pushing environmental sustainability into the procurement process. Census sampling technique was used to select the twenty-two districts due to all the districts being in one region, Western Region; and the number of districts relatively small. Sample frame was collected from Western Regional Coordination Council. The sample size was eighty-eight (88) people drawn from the population of twenty-two (22) districts in the Western Region of Ghana. The population were in four subgroups of twenty-two each from district engineers, procurement officers, environmental officer, and procurement officers. The personal visits to the respondents took place over a period of three months between May 2014 and July 2014.

Questionnaires: In all 88 questionnaires were distributed personally to respondents. Out of this figure, 22 were given to procurement officers, quantity surveyors, district engineers, and the rest were given to environmental officers. Sixty questionnaires were retrieved representing a response rate of 68%. The structured questionnaire was used to guide the researcher in interviewing the respondents. The questionnaire consisted of

both open and closed ended questions. The questionnaire was used because respondents could be able to respond to the questions unaided. Also the questionnaire facilitated the collection of data that ensured the best matching of concepts with reality.

Conceptual framework of the study: This research adopted Dolva's

Table 4. 1 Mmda's In the Western Region Used In the Research

LI	METROPOLITAN	CAPITAL	NUMBER OF RESPONDENTS
1928	Sekondi-Takoradi	Sekondi	4
	MUNICIPAL ASSEMBLIES		
1886	Tarkwa Nsuaem	Tarkwa	4
1917	Nzema East	Axim	4
2015	Sefwi Wiaso	Sefwi Wiaso	4
	DISTRICT ASSEMBLIES		
1387	Bibiani/Ahwiaso/Bekwai	Bibiani	4
1394	Jomoro	Half Assini	4
1395	Ahanta West	Agona Nkwanta	4
1757	Amenfi West	Wassa Akropong	4
1840	Prestea-Huni Valley	Bogoso	4
1882	Shama	Shama	4
1884	Sefwi Akontobra	Sefwi Akontobra	4
1918	Ellembele	Nkroful	4
2011	Wassa Amenfi Central	Manso	4
2012	Wassa Amenfi West	Asankroguia	4
2013	Bia West	Essam-Dabiso	4
2014	Bia East	Adabokrom	4
2016	Suaman	Dadieso	4
2017	Aowin/Suaman	Enchi	4
2018	Wassa East	Daboase	4
2019	Mpohor	Mpohor	4
2020	Juaboso	Juaboso	4
2021	Bodie	Bodie	4
22			88

actor- oriented perspective on the norm model (Dolva, 2007). It was adopted and used as a basis for the questionnaire and as an instrument for guiding the analysis and discussion of the data collected. Hyden (2002) argued that in order to promote sustainable policies such as environmental sustainability, the following three (3) issues must be addressed:

- Will (certain set of values motivating environmental sustainability),

- Knowledge (knowledge on how to incorporate environmental sustainability) and
- Opportunity (the possibility to do so in practice).

He argued that will, knowledge and systematic conditions are necessary to transfer sustainable policies into action. He developed a model based on these factors called the norm model upon which this study was based.

RESULTS

Distribution of Respondents

As can be seen from Table 4.1, 4 respondents were drawn from the Western Region’s Metropolis, Municipal and district assemblies, comprising District Engineers, Quantity Surveyors, Procurement Officers and Environmental Officers. Out of the total number of 88 questionnaires sent, 60 responses were received representing 68%.

Parts of the Tender Documents to Insert Environmental Sustainability Issues

Respondents were asked to indicate which part of the tender documents were relevant areas to insert environmental considerations and at what stages in the procurement process are potential areas to introduce environmental sustainability issues. Table 4.2 below depicts the summary of respondents’ responses on the part of a tender document that environmental sustainability issues may be incorporated. Respondents were asked to rank their level of agreement to the parts of the tender document where environmental issues may be incorporated on a 5 point Likert scale (where 1-Strongly Disagree, 2-Disagree, 3-Uncertain, 4-Agree, and 5-Strongly Agree). The results were ranked based on their mean scores and are presented in Table 4.2 below and discussed (*c.f.* Ayarkwa et al., 2010).

Table 4. 2 Part of a Tender Document That Environmental Sustainability Issues Are Incorporated

Parts of the Tender Document	Mean	Std. Deviation	Rank
The Subject Matter of the Contract	4.27	1.023	2nd
Technical Specifications for the Product/Work/Service	4.15	.899	4th
The Selection Criteria for Candidates	3.98	1.000	5th
The Contract Award Criteria	4.27	1.103	3rd
The Contract Performance Clauses	4.43	.789	1st

A mean score of 3 and above was considered significant

Respondents ranked the ‘contract performance clause’ (mean- 4.43, standard deviation .789) first, indicating strong agreement that it is the

best part of the contract document to insert an environmental requirement. It must however be noted that almost all the parts recorded high means indicating that all parts of the tender document are likely areas to include an environmental sustainability issue. Nevertheless, three of the variables had high standard deviations, namely 'the subject matter of the contract' (1.023), 'the selection criteria' (1.0), and 'the contract award criteria' (1.103). This indicates variability in the data collected and inconsistency in agreement among the respondents. The results emphasized that, in all parts of a tender document, environmental sustainability issues may be incorporated, but only with the involvement of Environmental Officers would this be realised since they have the environmental responsibility at the district level. The key issue is not to breach the basic procurement ethics (European Commission, 2011; British Standards Institution, 2010, Public Procurement Act, Act 663, 2003). This is a good signal that portrays opportunity for environmental considerations even with the current procurement system in Ghana.

Stages to Incorporate Environmental Sustainability in the Construction Procurement Process

Table 4.3 below, shows the summary of responses on the stages of procurement that environmental sustainability may be incorporated. Respondents were asked to indicate their level of agreement to the stages in the procurement process where environmental issues may be incorporated on a 5 point Likert scale (where 1-Strongly Disagree, 2-Disagree, 3-Uncertain, 4-Agree, and 5-Strongly Agree). The results were ranked based on their mean scores and are presented in Table 4.5.

Table 4. 3 Stage of Procurement That Environmental Sustainability Issues Are Incorporated

Stages of Procurement	Mean	Std. Deviation	Rank
Establishing What is to be Procured	*3.98	1.242	3rd
Decision on Procurement Strategies in terms of Contract, Pricing and Targeting Strategy and Procurement Procedure	*3.87	1.142	5th
Soliciting Tender Offers	*3.90	1.175	4th
Evaluation of Tender Offers	*4.20	1.132	1st
Award of Contract	2.12	1.195	6th
Administering Contracts and Confirmation of Compliance with Requirement	*4.10	1.160	2nd

A mean score of 3 and above was considered significant

The fourth stage of procurement, Evaluation of tender offers, recorded the highest mean value of 4.20. This suggests that respondents strongly agreed that it is the best stage in procurement to introduce an environmental sustainability issue. It is surprising to note that, all the variables had high standard deviations, indicating variability in the data collected and inconsistency in agreement among the respondents. Administering contracts and confirmation of compliance with requirement had the second highest mean value of 4.10. This also suggests that respondents strongly agreed that it was crucial to confirm compliance with

environmental requirements during the contract execution period. However, theory suggests that all stages are relevant areas to include an environmental issue (European commission 2011). It can be concluded that, in totality, almost all the respondents agreed that at each stage of the tendering process, environmental sustainability could be incorporated though there was inconsistency in agreement among the respondents. Again, the key issue here is that basic procurement ethics must not be breached (European Commission, 2011; British Standards Institution, 2010, Public Procurement Act, Act 663, 2003)

Factors Driving the Incorporation of Environmental Sustainability into Construction Procurement at the District Level

Respondents were asked to score on a scale of 1 (Least) to 5 (Highest) the significance of the various factors driving the incorporation of environmental sustainability into construction procurement at the district assembly level that were identified from literature. These factors are analysed and presented below. The variables were coded for easy interpretation.

CODE	VARIABLE
V1	Gaining competitive advantage
V2	Government pressure
V3	Investor pressure
V4	Awareness of environmental impacts
V5	Consensus on standard EMS needed in sector
V6	Environmental culture among competitors
V7	Society pressure
V8	Legislature and Legal compliance
V9	Develop good image
V10	Desire to improve quality on performance
V11	Skilful policy procurement/environ officers
V12	ISO 14001certification
V13	Desire to manage economic risk
V14	Potential for receiving publicity
V15	Reduce risk of consumer criticism

From Table 4.4, it can be seen that reducing risk of customer criticism (V15), legislature and legal compliance (V8), desire to manage economic risk (V13), developing good image (V9) and gaining competitive advantage (V1) were considered as the major factors driving the incorporation of environmental sustainability into construction procurement at the district

assembly level. All these factors had mean scores greater than the mean value of 3.0. Other factors driving the incorporation of environmental sustainability into construction include government pressure (V2), ISO14001 certification (V12), consensus on standard EMS needed in sector (V5) and awareness of environmental impacts (V4). Investor pressure (V3), society pressure (V7) and desire to improve quality on performance (V10) on the other hand were considered the least factors by the respondents.

Table 4. 4 Factors Driving the Incorporation of environmental Sustainability into Construction Procurement at the District assembly level

Code	Factors	Mean	Std. Deviation	Rank
V1	Gaining competitive advantage	*4.09	1.11	5th
V2	Government pressure	*3.91	1.18	6th
V3	Investor pressure	1.49	0.61	15th
V4	Awareness of environmental impacts	*3.65	1.27	9th
V5	Consensus on standard EMS needed in sector	*3.73	1.34	8th
V6	Environmental culture among competitors	*3.56	1.39	10th
V7	Society pressure	2.35	0.93	14th
V8	Legislature and Legal compliance	*4.60	0.66	2nd
V9	Develop good image	*4.24	0.98	4th
V10	Desire to improve quality on performance	1.91	0.89	13th
V11	Skilful policy procurement/envirom officers	*3.22	1.34	12th
V12	ISO 14001certification	3.87	1.09	7th
V13	Desire to manage economic risk	*4.45	0.74	3rd
V14	Potential for receiving publicity	*3.31	1.41	11th
V15	Reduce risk of consumer criticism	*4.85	0.36	1st

A mean score of 3 and above was considered significant

Source: Field Survey 2014

Table 4.5 represents the correlation matrix of the data. The correlation matrix helped in determining the relationship between the various factors. The highest correlation occurred between V₁₄ (potential for receiving publicity) and V₁₂ (ISO 14001certification) with the value of 0.63. The second highest correlation occurred between V₆ (environmental culture among competitors) and V₅ (consensus on standard EMS needed in sector) with the value of 0.60. Other correlations like V₇ (Society pressure) and V₆ (environmental culture among competitors), V₁₂ (ISO 14001 certification) and V₂ (government pressure) have moderate high correlation, 0.44. Table 4.5 also show that, there exist a negative correlation between V₈ (legislature and legal compliance) and V₃ (investor pressure) with a value of -0.29. There is also a negative correlation of -0.10 between V₁₀ (mode of dressing) and V₈ (legislature and legal compliance).

The KMO statistic varies between 0 and 1 with a value of zero indicating that the sum of partial correlations is large relative to the sum of

correlations. This indicates diffusion of pattern of the correlations, and hence, factor analysis is likely to be inappropriate (Field, 2005). A value close to 1.00 indicates that patterns of correlation are relatively compact and so factor analysis should yield distinct and reliable factors (Field, 2005). However, literature recommends that the KMO value should be greater than 0.50 if the sample size is adequate (Child, 1990 and Field, 2005). With the KMO value of 0.8, as indicated in Table 4.6 above, it means that the factors are meritoriously adequate for factoring. This suggests that factor analysis is appropriate and correlation matrix is appropriate for factoring. The Bartlett's test of sphericity is also significant. The correlation analysis, the KMO and the Bartlett's tests above suggest that, there are correlations among the indicator variables and hence, the original 15 indicators can be subjected to a factor analysis procedure.

Table 4. 5 Correlation Matrix
Source: Field Survey 2014

	V ₁	V ₂	V ₃	V ₄	V ₅	V ₆	V ₇	V ₈	V ₉	V ₁₀	V ₁₁	V ₁₂	V ₁₃	V ₁₄	V ₁₅
V ₁	1.00														
V ₂	0.09	1.00													
V ₃	-0.23	0.09	1.00												
V ₄	0.22	0.13	0.13	1.00											
V ₅	0.15	0.28	0.03	0.27	1.00										
V ₆	0.42	0.17	-0.03	0.32	0.60	1.00									
V ₇	0.27	0.00	-0.01	0.28	0.38	0.44	1.00								
V ₈	0.33	-0.10	-0.29	0.39	0.15	0.33	0.23	1.00							
V ₉	0.29	0.02	-0.26	0.10	0.23	0.27	0.19	0.41	1.00						
V ₁₀	-0.07	-0.06	0.19	0.09	0.07	-0.08	-0.01	-0.10	-0.08	1.00					
V ₁₁	-0.29	0.27	0.14	0.15	0.33	0.25	0.18	0.04	0.21	-0.05	1.00				
V ₁₂	0.07	0.44	0.04	0.17	0.23	0.04	-0.07	-0.07	-0.25	0.12	0.10	1.00			
V ₁₃	0.17	0.20	-0.09	0.07	0.22	0.22	-0.07	0.38	0.31	-0.22	0.25	0.05	1.00		
V ₁₄	-0.17	0.33	0.12	0.23	0.38	0.28	-0.08	-0.06	-0.31	0.21	0.21	0.63	0.09	1.00	
V ₁₅	-0.20	-0.08	-0.09	-0.03	0.19	-0.06	0.04	0.14	0.05	0.02	0.15	-0.05	0.11	-0.02	1.00

Table 4. 6 KMO and Bartlett's Test

Measure	value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0.77
Bartlett's Test Critical Value	234.44
Bartlett's test degree of freedom	105
Bartlett's significant value	0.00

Source: Field Survey 2014

Table 4. 7 Total Variance Explained

Component	Total	% of Variance	Cumulative %
1	4.85	28.56	28.56
2	2.98	17.55	46.11
3	1.98	11.62	57.73
4	1.39	8.20	65.93
5	1.29	7.57	73.50

Source: Field Survey 2014

Using the Eigenvalue greater than one rule, the first factor explained about 28.56% of the data. The second factor also explained about 17.55% of the data, the third factor explained about 11.62% and the fourth factor explained about 8.20% of the data. The cumulative percentage of these four components amounted to 65.93%. This is highly significant to explain the total variations in the data.

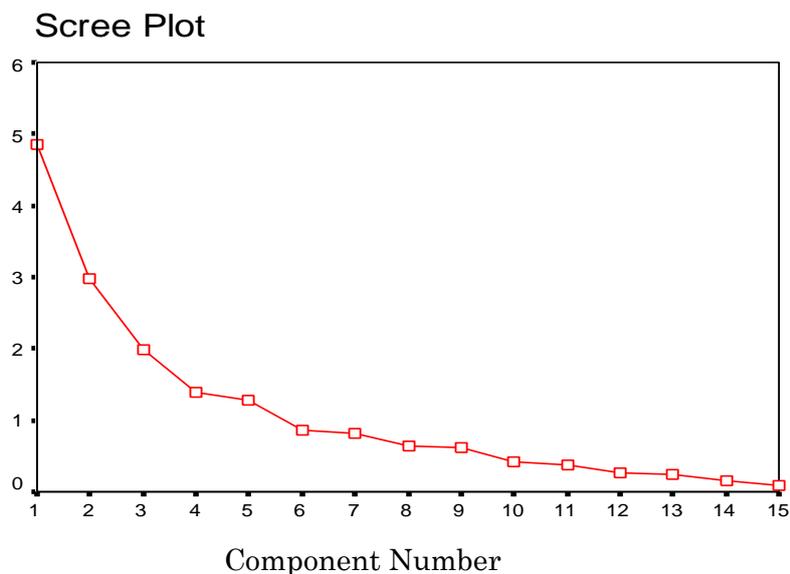


Figure 4. 2 Scree Plot (Source: Field Survey 2014)

From Figure 4.2, it can be seen that the ‘elbow’ of the diagram occurs at the fourth component. This intends depicts that, the number of factors that should be considered for extraction is four (4).

Setting a cut-off point of 0.5, the following factor groupings were obtained. Table 4.8 above presents the results of the rotated component matrix. The interpretability of results can be improved through rotation (Norusis, 2000). The rotated factor solution is displayed by default and is essential for interpreting the final rotated analysis. Rotation suggests the behaviour of the variables under extreme conditions and maximizes the loading of each variable on one of the extracted factors whilst minimizing the loading on all other factors and it is best factor output solutions for interpreting factor analysis (Child, 1990).

Table 4. 8 Rotated Factor Matrix

Component		1	2	3	4
Code	Variable				
V1	Gaining competitive advantage	0.02	0.39	0.37	-0.80
V2	Government pressure	0.92	0.02	0.52	0.03
V3	Investor pressure	0.06	-0.04	-0.14	0.16
V4	Awareness of environmental impacts	0.24	0.21	-0.20	0.03
V5	Consensus on standard EMS needed in sector	0.36	1.09	0.07	0.24
V6	Environmental culture among competitors	0.13	1.22	0.18	-0.07
V7	Society pressure	-0.18	0.48	0.08	0.03
V8	Legislature and Legal compliance	-0.09	0.17	0.13	-0.09
V9	Develop good image	-0.25	0.28	0.60	0.04
V10	Desire to improve quality on performance	0.04	0.04	-0.42	0.05
V11	Skilful policy procurement/envirom officers	0.27	0.27	0.42	1.13
V12	ISO 14001 certification	0.91	0.02	-0.18	-0.10
V13	Desire to manage economic risk	0.14	0.13	0.33	0.05
V14	Potential for receiving publicity	1.04	0.43	-0.67	0.25
V15	Reduce risk of consumer criticism	-0.03	0.03	0.00	0.09

Source: Field Survey 2014

Upon critical examination of inherent relationships among the various factors identified, the various principal components were named. The names of various principal components were formed based on the factors with the highest loadings and the understanding of the relevance of these factors in the context of the study. The various principal components extracted are: Component 1: Leadership Influence; Component 2: Environmental culture; Component 3: Public Influence and Component 4: Personal Skills.

DISCUSSION

Factors Driving the Incorporation of Environmental Sustainability into Construction Procurement at the District assembly Level

The discussions herein are based on the components extracted with their respective factor loadings.

Component 1: Leadership Influence: It was observed that, component one loads highly on V_2 (government pressure-0.92), V_{12} (ISO 14001certification- 0.91) and V_{14} (potential for receiving publicity-1.04). Thus the factor here is named leadership influence. From Table 4.7, this cluster accounted for 28.56% of the total variance. A significant body of research indicates that government pressure is a major driver for companies' environmental efforts (Walker et al., 2008, Adetunji et al., 2008, Varnas et al., 2008). According to Walker et al. (2008) government can play a leading role in driving environmental sustainability into the

procurement process. This could be done by creating the opportunity in the form of procurement legislature and laws that allow for environmental sustainability to be incorporated into the construction procurement process for implementation at the district assembly level. According to Walker (2008), ISO certification drives the incorporation of environmental sustainability into the procurement process. The findings agree with literature that current procurement laws in Ghana addresses few sustainability issues (Boyefio, 2008), and that the government must take the lead in promoting environmentally friendly practices through more proactive environmental legislature specially designed for procurement of works.

Component 2: Environmental culture: Component two loads highly on V₅ (consensus on standard EMS needed in sector-1.09) and V₆ (environmental culture among competitors-1.22). Thus the factor here is named environmental culture. From Table 4.10, this cluster accounted for 17.55% of the total variance. These two factors indicate that to be able to incorporate environmental issues into construction procurement there is the need for Procurement Officers and District Engineers to develop an environmental culture. This should be enabled by a common Environmental Management Standard available for implementation in the various districts. This would ensure an effective Environmental Management System to be established among all the districts (Gonzalez-Benito and Gonzalez-Benito, 2005).

Component 3: Public Influence: The third component loaded highly on V₁₄ (potential for receiving publicity-0.67), V₉ (develop good image-0.6) and V₂ (government pressure-0.52), thus the factor is named public influence. From Table 4.10, this cluster accounted for 11.62% of the total variance. This result agrees with literature. Walker (2008) observed that public awareness on environmental impact of construction activities is drastically increasing, and this generates pressure to improve environmental performance in the construction industry. Public pressure and stakeholders are causing firms to review their environmental supply practices (Delmas, 2001). Some non-governmental organisations (NGOs) are putting pressure on organisations to improve their environmental performance (Gabriel et al., 2000).

Component 4: Personal Skills: Component four loads highly on V₁₁ (Skilful policy procurement/envirom officers-1.13) and V₁ (gaining competitive advantage-0.80), thus the factor is named personal skills. From Table 4.10, this cluster accounted for 8.2% of the total variance. This agrees with the observation of Drumwright (1994) cited in Walker (2008) that in order to incorporate environmental sustainability into construction procurement, personal skills of responsible officers is key. Improvement on the financial performance of the district and reduction in cost of environmental impacts of construction procurement activities would enable the district to gain a competitive advantage over other districts, especially in competing for the national purse, but this can only be achieved through the personal skills of

responsible officers for construction procurement at the various districts (Gonzalez-Benito and Gonzalez-Benito, 2005).

Discussion based on Hyden's norm theory

The discussions are herein related to the main factors of Hyden's norm theory explained in the methodology. The three components of the norm-model were identified and grouped as shown in Fig 4.2.

Opportunity: previous research revealed that lack of government guidance limited any progress of incorporating environmental sustainability into procurement. According to Dolva (2007), there are several aspects that can determine the procurement officer's opportunity to integrate environmental sustainability into their procurement process. This research found such factors as political/administrative initiatives, organisational structures, laws and regulations or public awareness. The findings show the availability of laws in Ghana to promote sustainable construction in the districts. The fact that none of the districts had environmental officers as key members in works procurement, and that the district engineers felt it was their duty though they did not have the requisite laws show how indeed it did limit the promotion of environmental sustainability into construction procurement. Positive results have been achieved in donor funded projects where environmental officers are given the opportunity to operate as safeguard officers to enforce environmental regulations in the contracts.

Will: Wickenberg (2004) argued that administrative decisions are taken by the procurement officer at the local level, where opportunities and constraints as well as prevalent norms and knowledge can determine the successful incorporation of environmental sustainability into the procurement process (Dolva, 2007). The results revealed that a strong will to include environmental sustainability into construction procurement at the district level exists. The answers and considerations by the environmental officers indicated that they all felt it as an important aspect of their responsibility. But it was revealed that most of the district engineers were of the view that they could handle that aspect. This in itself does not indicate that there is no will. It is however important to note that there was a general misunderstanding of how to insert environmental requirements into contracts. Respondents indicated that they had the will but felt little public pressure or consumer criticism to push them to do so.

Knowledge: the results from the questionnaires indicate that there is lack of knowledge on how to transform environmental sustainability issues into contractually enforceable requirements. The current procurement documents have no provisions for environmental sustainability issues. The research also revealed that there was no guidance from government, no tailor-made training and limiting standards to promote such issues into the procurement practice. From the findings one can conclude that knowing what environmental aspects to consider, procurement documents that have provision made for environmental sustainability, knowing how to introduce environmental sustainability into the procurement process

are crucial factors in incorporating environmental sustainability into construction procurement. The findings support the notion that without knowledge the will to include environmental requirements might not be utilised.

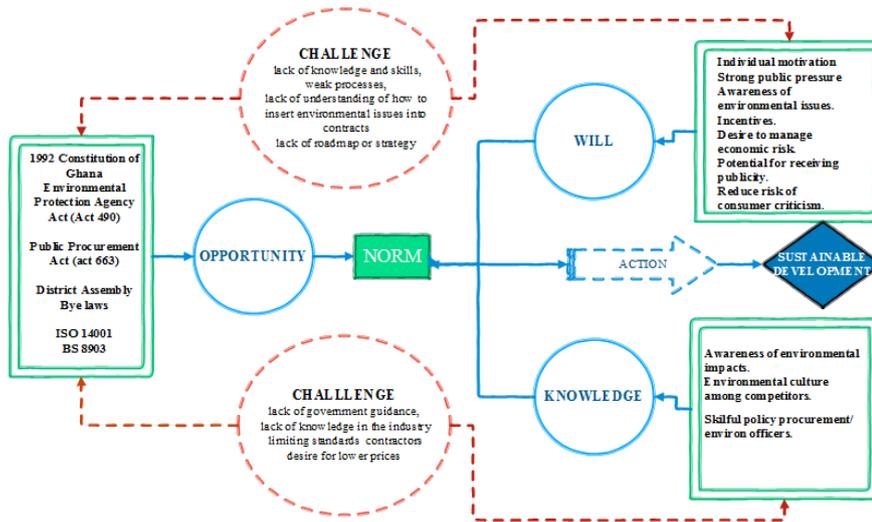


Figure 4. 2 Factors driving the incorporation of environmental sustainability into construction procurement based on hyden’s norm theory

CONCLUSION

The survey responses highlighted that all key stakeholders; namely District Engineers, Environmental Officers, Quantity Surveyors and Procurement Officers, have a considerable role to play across all the procurement stages. It was evident from the survey results that the major factors driving the incorporation of environmental sustainability into construction procurement are desire to reduce risk of consumer criticism (in this case community members), legislature and legal compliance, desire to manage economic risk, and desire to develop good image. These factors were put together under four components namely: leadership influence, environmental culture, public influence and personal skills. The research calls for the need for an environmental culture among stakeholders to be developed, and enabled by a common Environmental Management Standard available for implementation in the various districts. The personal and ethical values on the environment of Environmental Officers, District Engineers, Procurement Officers and Quantity Surveyors in the various districts could filter through the whole organization if these professionals are proactive. Interestingly, Environmental Officers are seldom consulted in most of the construction activities that take place at the district level. It has become necessary to include Environmental Officers as key members of the works department at the district assemblies since there is constant degradation of the forest, farm lands, water bodies, and constant air and noise pollution. Environmental officers seem to be the best expertise at the district level to highlight these

problems in the procurement process and to help the various district assemblies to develop a good environmental culture. This research has highlighted that the identification and inclusion of environmental sustainability issues into construction procurement and tender documents are important factors in environmental management at the district level. Also through this research, a new paradigm of environmentally friendly construction mind-set is suggested to be employed by the works department at the district assembly level in order to produce more environmental sustainable projects. Finally, it has been ascertained that the exploitation of the knowledge of Environmental Officers within the structure of the local government system through the procurement processes is vital for the acquisition of added value environmental sustainable construction projects.

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