UTS ePRESS

Construction Economics and Building

Vol. 17, No. 1
March 2017

RESEARCH ARTICLE

The Socio-Economics of Women Inclusion in Green Construction

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DOI: http://dx.doi.org/10.5130/AJCEB.v17i1.5344
Article History: Received 11/01/2017; Revised 22/02/2017; Accepted 26/02/2017; Published 31/03/2017

Citation: Afolabi, A.O., Tunji-Olayeni, P.F., Oyeyipo, O.O. & Ojelabi, R.A. The Socio-Economics of Women Inclusion in Green Construction. *Construction Economics and Building*, 17:1, 70-89. http://dx.doi.org/10.5130/AJCEB.v17i1.5344

ISSN 2204-9029 | Published by UTS ePRESS | ajceb.epress.lib.uts.edu.au

Abstract

The female population represents one of the greatest untapped resources for economic growth and revitalization in most sectors. The purpose of the study was to examine the socio-economics of women's inclusion in green construction. The study utilized the use of questionnaires which were distributed to female professionals in the Nigerian construction industry. A total of 120 female construction professionals were used for this study. The data gathered was analysed using SPSS v17.0 with tests such as Frequencies, Percentages, Mean Score, ANOVA, and Factor Analysis. The result revealed a low level of participation by women in green construction. Women in construction exhibited moderate participation in Solar panel manufacturing, installation, and maintenance and in the enforcement of environmentally friendly practices on-site. The study revealed that the stressful nature of works, low interest from women, low career growth/progression and low investments in green works are significant barriers affecting women's inclusion in green construction. In conclusion, the study identified three (3) socio-economic benefits of women's inclusion in green construction. These are family/women related benefits, environment related benefits, and green energy market related benefits. The study suggested measures to increase women's participation in green construction.

Keywords

Climate Change, Economics, Gender, Green Construction, Women Inclusion

DECLARATION OF CONFLICTING INTEREST The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. **FUNDING** The author(s) received no financial support for the research, authorship, and/or publication of this article.

Introduction

The OECD (2009) report projected a 70% increment in the greenhouse gas (GHG) emissions resulting in increased world temperature if the activities of the world continue unabated. The increasing GHG emissions have been linked to melting ice caps in the North Pole, record breaking temperatures, desertification, wildfires, drought, and sea level rise resulting in unprecedented floods. Unfortunately, a large percentage of the population in least developed and developing countries (LDDC) are usually unduly affected by these issues which often undermines any previous or present development strategies being implemented. Apart from children, amongst the most exposed to the risks of climate change are the female population in these countries. Statistics revealed that women represent 60 per cent of the world's working poor (Koppel, 2010). Gurjao (2008) and Aja-Okorie (2013) observed that women remain disadvantaged gender-wise in many areas of life. Anugwom (2009) noted that the gender bias ranges from exclusion from policy making, to labour market discriminations. Proof from the latter reveals the low participation of women in the formal sector (Fapohunda, 2012). The rating of Nigeria as 118th in the Gender Equality Index of 2012, out of 134 countries considered, reveals the disparity that exist in this developing country.

Errázuriz (2010) argued that women can act as change agents to any crises facing human well-being by contributing to policies and actions that promote sustainable economic growth and development in any sector of a nation's economy. The National Bureau of Statistics (2014) reported that investing in female education produces extremely high socio-economic profit. Hibbett and Meager (2003) observed that girls now perform better than boys in education and in getting higher qualifications. But, to what benefit, if they are not utilised.

Globally, at 40 per cent, the female population is a continuously growing economic work force. Gurjao (2008) opined that this increase can be attributed to the deskilling of historical male job, rising levels of educational attainment, and economic necessity. Women can fulfil economic needs globally. The idea is that if something is economic, it makes profit. Ezegbe and Akubue (2012) emphasized that the roles of women need to be considered, recognized, and treasured to attain development in any human society. Ely and Thomas (2001) and Gurjao (2008) argued that diversity engenders effectiveness, sustainable growth, and development. Koppel (2010), further posited that when women's roles are made more obvious, the result has often impacted on family health and human welfare. Engaging women in matters that concern the earth and its environment can have serious benefits. However, the construction industry, one of the contributors to the issues of climate change, has a scanty under-representation of women (Adeyemi et al., 2006; Powell, Dainty and Bagilhole, 2010; Bagilhole, 2014).

Problems facing earth's ecosystem brought about the term "green". This concept has been applied in different areas resulting in green construction, green economy, green energy etc. Rustico and Terzimehic (2010) argued that this field has the potential for employment creation for now and the future. A recent industry survey indicated that the percentage of green construction projects grew from 16 to 40 percent within the space of 3 years and is projected to increase further to 53 percent in another 3 years (McGraw Hill Construction, 2013). The term green jobs, found in all related green activities is broadly defined as "those that contribute appreciably to maintaining or restoring environmental quality and avoiding future damage to the Earth's ecosystems (UNEP/ ILO/IOE/ITUC, 2008). This study posits that this is one area women can increase their participation in construction trades as situated in "green" construction. Hegewisch and O'Farrell (2015) suggested that harnessing the affinity young women have for environmental issues may be the changing factor in trying to balance the gender inequality that presently exist in the construction industry.

The uniqueness of this study is that the green concept has scarcely been analysed from a gender perspective. Major focus in the green concept has been on investment and technology intervention. Hegewisch and O'Farrell (2015) argued that the virtual segregation of one gender from work in any industry means that it is losing out on potential talent that may help such sector.

The study considers a gender perspective in solving issues raised in going green in the construction industry. Going green in the construction industry starts from design before actual implementation. Davis (2014) opined that having women in construction design and implementation teams can help to soften the environment, inspire innovation, challenge the norms, and enhance collaboration. Several studies have revealed that there is great profit derived from female inclusion in every sphere of human existence (Adeyemi et al., 2006; Bradshaw, Martorano and Neubourg, 2013). Having this understanding, the study examines the economics of women's inclusion in green construction. The study intends to proffer answers to the following pertinent research questions;

- In what ways do women participate in green construction?
- What are the barriers to women's inclusion in green construction?
- What socio-economic benefits can be derived from women's inclusion in green construction?

Women participation in the construction industry

Even though it has been adjudged that women have potentials that are necessary for national and global impact, Anugwom (2009) and Ezegbe and Akubue (2012) reported that women are still been denied basic rights. In general employment rights, Kumar (2013) reported that there exist direct or indirect discrimination against women workers. This can be found in recruitment, selection for skilled jobs, wages, and promotions.

One such sector is the construction industry. Although, the construction industry is the largest employer of labour (Adeyemi et al., 2006; Fagbenle and Oluwunmi, 2010; Afolabi et al., 2016), most of its employees are men. Despite efforts through national and international equality policies, Sang and Powell (2012) observed that the construction industry remains one of the most male dominated sectors. Gurjao (2008), stated the construction industry is territorial in nature, with a reluctance to accept women's skills. This is a major barrier to entry, development, and retention of women in this sector (Amaratunga et al. (2006). Hegewisch and O'Farrell (2015) argued that this should be a concern for equity and economics.

Studies from highly populated countries such as Pakistan (ILO, 2011), Nigeria (Adeyemi et al., 2006), India (Kumar, 2013) have shown that women's participation in the construction industry is statistically poor. In developed economies, such as the United Kingdom, the case is no different. Mun (2014) recorded that only 11 percent of women are actively engaged in this sector. Bagilhole (2014) states this engagement is mostly in administrative positions, or other positions not directly involved in the construction process. Adeyemi et al. (2006) noted that this is the only position gap in the Nigerian construction industry where the male-female ratio is remarkably bridged at 38% to 62% for male. Powell, Dainty and Bagilhole (2010) stated that for the construction industry to progress, there is an active need to challenge the realities of a patriarchal construction industry.

Powell, Dainty and Bagilhole. (2010) opined that women face a multitude of challenges in the construction industry. Myriads of these challenges are exhibited in cultural and structural

barriers, such as harassment and discrimination, limited networking opportunities and long and inflexible working hours (Whittock, 2002; Dainty and Bagilhole, 2006; Lingard and Francis, 2006). Other barriers to women's participation in the industry include the poor image of the industry (Afolabi et al., 2016), heavy nature of industry, weak forbearance working in open conditions, harsh weather and foul language (Dainty, Bagilhole, and Neale, 2000; Agapiou, 2002); emotional stress and sexual harassment (Kehinde and Okoli (2004), lack of career knowledge (Amaratunga et al. 2006), family interferences, dearth of construction industry mentors, coequal pressure and low educational attainment (Whittock, 2002), vulnerable working environment (ILO, 2011).

The concept of green jobs and women participation

The construction industry contributes as much as 35 percent of the total global greenhouse gas (GHG) emissions annually (Adeleke, 2010; Kientzel and Kok, 2011). These emissions can be linked to the industry's massive reliance on fossil fuel energy during the production and transportation of building materials, construction, operation, and demolition phases. In addition, there have been links to the use of other environmentally damaging pollutants in the construction industry (Edem, 2011). The issues are made worse when design, construction and use of buildings cause unconscious and careless regard for the environment.

Nelson (2010), has suggested that experts are calling for immediate and far-reaching action to fight global warming and remedy its consequences. One of the most important tasks is to reduce greenhouse gas (GHG) emissions. Edem (2011) opined that given the massive growth and needs of the construction industry, if nothing is done, greenhouse gas emissions from buildings will more than double in the next few years. Responding to this pressing issue, energy efficiency and environmental assessment schemes, both mandatory and voluntary, have been implemented as policy instruments and strategies to reduce natural resource use and to improve energy efficiency from design to operation of buildings (Kientzel and Kok, 2011). New technologies are constantly being developed to complement current practices in creating greener structures. This is achieved by efficiently using energy, water and other resources and reducing waste, pollution, and environmental degradation (Edem, 2011).

In Bruyère and Filiberto (2013), the Bureau of Labor Statistics (BLS) broadly defined green jobs as employment "in businesses that produce goods or provide services that benefit the environment or conserve natural resources" or "jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources". UNDP (2016) defined green jobs as those jobs that do not harm the environment and have potential to revive it. According to the BLS, potential green jobs include; renewable energy sourcing (solar, wind, biofuels) including manufacturing, installation, and maintenance; Improving energy efficiency including services like home energy audits, home renovation and retrofitting, manufacture and provision of products like EE appliances, vehicles; Pollution reduction/removal, recycling, greenhouse gas reduction; Natural resource conservation including organic agriculture, sustainable forestry, storm water management; Environmental compliance, education and training including enforcing regulations, and public awareness. The United Nations Development Programme, UNDP (2016) noted that 50 million green jobs will be created worldwide by the year 2036, as governments, NGOs and businesses invest in reducing energy use, waste, protecting and restoring the damaged ecosystem.

Since women make up more than half the world's population, UNDP (2016) opined that women's perspectives on going green in any sector are crucial. The absence of female gender

participation in the construction industry and further green construction may be detrimental to the long-term sustainability of the industry and the world at large. Understanding the inequities imbalance would help to access the green jobs that are on offer. UNDP (2016), suggest with the crucial roles of women in the family and community base, women have an understanding of how to drive sustainable solutions and help curtail dangerous and harmful production and consumption patterns which have an adverse effect on the ecosystem. It is therefore important that the concept of going green is cognizant of women at every level. As investment in green jobs increases, it is important to also increase the participation of women in these areas.

UNRISD (2012) observed that job positions in green economy are largely closed to women. These are due to barriers identified by the Women's Economic Security Campaign (2010) such as a lack of training and role models in these fields, limited work supports, sexual harassment, and hiring discrimination. Rustico and Terzimehic (2010) and ILO (2015) added that issues regarding employability and participation, which may give women access to green job opportunities may further be limited due to inadequate skill sets, training, and experience.

Research method

The study built on previous research conducted on women's participation in the construction industry and the areas of green jobs in the construction industry. This research aims to engender the economics by measuring the level of participation, barriers, and socio-economic benefits to be derived from women's inclusion in the green jobs available in the construction industry. The population is a summation of all women in the construction industry in Nigeria. The findings are based on a subset of women in the construction industry in Lagos State. Lagos State is an economic hub of Nigeria and highly developed, with a high concentration of construction professionals, high volume of state-of-the-art completed and ongoing construction projects, and high applications in the areas of green construction. The state has been classified as a Mega city and is presently arming itself with necessary buildings and infrastructure to cope with its new status. The women used for this study fall into the categories of construction professionals in the fields of architecture, building technology, quantity surveying, mechanical, civil, and electrical engineering. Based on the type of study, a survey research design was conducted on the identified sample. The respondents were chosen using a purposive sampling method due to the characteristics of the sample. This method was used due to the easy access of the respondents to the researcher and the willingness of the study sample to participate in the study. The research data analysis was based on a structured questionnaire directed to women construction professionals in these six fields in the construction industry. The questionnaire is divided into four sections; the background information of the respondents, the areas of green construction in the construction industry, the socio-economic benefits to be derived from women's inclusion in green construction and the barriers to women's inclusion in green jobs available in green construction. The questionnaire was measured using a five point Likert scale. A total of 180 questionnaires were distributed to women in the construction industry in Lagos State. A total of 120 completed questionnaires were returned, representing a 66.7% return rate. These were adequately scrutinized for errors and omissions. The data obtained was analysed using Statistical Package for Social Sciences, SPSS v.17 software. Statistics tests such as Frequencies, Percentages, Mean Score, ANOVA, and Factor Analysis tests were used for the study.

Findings and discussion

This section analyses the data for the study and discusses the implications of the research. The headings are based on the three (3) research questions developed for the study. However, the background information is first highlighted.

BACKGROUND INFORMATION

A cross-section of the construction industry female respondents as shown in Table 1 revealed that 52.5% of the respondents had a B.Sc./B.Tech degree, 38 (31.7%) MSc/MBA/MPM,

Table 1 Background Information

Background Information	Frequency	Percent (%)	Cumulative Percent
Highest Academic Qualification			
BSc/B.Tech.	63	52.5	52.5
MSc/MBA/MPM	38	31.7	84.2
OND/HND	15	12.5	96.7
Ph.D.	4	3.3	100.0
Professional Background			
Civil Engineering	26	21.7	21.7
Building Technology	24	20.0	41.7
Architecture	20	16.7	58.3
Mechanical Engineering	20	16.7	75.0
Quantity Surveying	15	12.5	87.5
Electrical Engineering	15	12.5	100.0
Professional Affiliation			
NSE	61	50.8	50.8
NIOB	24	20.0	70.8
NIA	20	16.7	87.5
NIQS	15	12.5	100.0
Level of Professional Affiliation			
Graduate	90	75.0	75.0
Corporate	19	15.8	90.8
Associate	11	9.2	100.0
Construction Industry Experience			
1-10yrs	101	84.2	84.2
11-20yrs	14	11.7	95.8
21-30yrs	5	4.2	100.0

15 (12.5%) OND/HND and 4 (3.3%) Ph.D. All respondents participating in the study had formal education appropriate for their positions. An examination of the professional background showed that 26 (21.7%) Civil Engineers, 24 (20%) Builders, 20 (16.7%) Architects, 20 (16.7%) Mechanical Engineer, 15 (12.5%) Quantity Surveyors and 15 (12.5%) Electrical Engineers participated in the study. The breakdown indicated a balance in the women construction professionals that participated in the study. Furthermore, the professional affiliation displayed 4 main professional bodies which were 61 (50.8%) Nigerian Society of Engineers, 24 (20%) Nigerian Institute of Building, 20 (16.7%) Nigerian Institute of Architects and 15 (12.5%) Nigerian Institute of Quantity Surveyors. However, the level of participation in their respective professional bodies was low. From Table 1, 90 (75%) of the women construction professionals were still graduate members, 19 (15.8%) Corporate members and 11 (9.2%) Associate Members. The construction industry experience of the respondents revealed that 101 (84.2%) of the respondents had 1-10yrs, 14 (11.7%) had 11-20yrs while 5 (4.2%) had 21-30yrs industry experience.

AREAS OF GREEN CONSTRUCTION PARTICIPATION

The study identified sixteen (16) crucial areas of green construction from literature and corroborated by construction professionals. Table 2 revealed the level of participation of women in green construction in Nigeria. Women in construction exhibited moderate participation in Solar panel manufacturing, installation, and maintenance and in the Enforcement of environmentally friendly practices on-site which are areas of green construction. The manufacturing and installation of solar panels has become an area of green construction where females are creating a niche for themselves, especially in a country with increasing use of generators adversely affecting the atmosphere. Similarly, the enforcement of environmentally friendly practices has seen women at the forefront, albeit still a male dominant sector in Nigeria. However, there is relatively low participation of women in Environmental compliance, Waste reduction, Pollution reduction, Reduction of water usage on site and Home retrofitting. Table 2 revealed that women do not participate in most areas of green construction. Some of the areas of green construction with no participation include but are not limited to; Auditing of home energy use, planting of trees, flowers and grasses, Storm water management, Wind turbines manufacturing, installation and maintenance, Environmental protection/preservation, Production of environmentally friendly appliances and building materials and Biofuel turbine manufacturing, installation and maintenance. It is surprising to note that planting of trees, flowers and environmental protection/preservation indicate no participation of females in recent times. The green construction industry is an industry that makes use of specific skills which require experience. With women having little or no participation in the areas of green construction surveyed, it is safe to assume that it would be hard for women to break the male dominance syndrome of the sector.

BARRIERS TO WOMEN INCLUSION IN GREEN CONSTRUCTION

Current studies on globalization, diversification and equality have made the subject of female inclusion a topic that is well discussed. But, apparently, as one barrier is removed another is formed or only lip service is paid, not actualization of women's inclusion. The study highlighted eighteen (18) barriers to women's inclusion in green construction evident in the literature review. The study therefore assessed the agreement among different women construction professionals on the level of significance of the barriers to women's inclusion in green construction. The respondents were women in the construction industry with

Table 2 Level of participation of women in areas of green construction

Areas of green construction	Mean	Remark
Solar panel manufacturing, installation, and maintenance	2.82	Moderate participation
Enforcement of environmentally friendly practices on-site	2.58	Moderate participation
Environmental compliance, education, and training of public	2.41	Low participation
Waste reduction, reuse and recycling	2.38	Low participation
Developing of green and sustainable designs	2.00	Low participation
Pollution Reduction/ Removal	1.84	Low participation
Reduction of water usage on-site	1.79	Low participation
Insulation panels manufacturing, installation, and maintenance	1.53	Low participation
Home retrofitting	1.52	Low participation
Auditing of home energy use	1.43	No-participation
Planting of trees, flowers, and grasses.	1.18	No-participation
Storm water management	1.09	No-participation
Wind turbines manufacturing, installation, and maintenance	1.08	No-participation
Production of environmentally friendly appliances and building materials	1.07	No-participation
Environmental Protection/Preservation	1.00	No-participation
Biofuel turbine manufacturing, installation, and maintenance	1.00	No-participation

professional backgrounds in architecture, building, quantity surveying, mechanical, electrical, and civil engineering as they relate to the construction sector. The significant difference was evaluated with analysis of variance (ANOVA). The result was presented in Table 3. Table 3 indicated that among the eighteen (18) barriers to women's participation in green construction, only Stressful nature of works, Low interest from women, Low career growth/progression and Low investments in green works are barriers affecting women's participation in green construction, with significant difference among the women in construction with different professional background in the study. This is inferred from their p-value which is less than 0.05 (5% level of significance), signifying they are significant. This means that the construction professionals agree that four barriers are significant among women in construction. This is clearly supported by works from Dainty, Bagilhole and Neale (2000); Amaratunga et al. (2006); Adogbo, Ibrahim and Ibrahim (2015).

The question is which career is not termed stressful? Any pursuit of a career that an individual wants to succeed in comes with a price. Women perceive green construction as

Table 3 Level of significance of the barriers to women inclusion in green construction

		Sum of Squares	df	Mean Square	F	P value	Sig.
Male dominance of green jobs	Between Groups	1.018	5	.204	1.483	.201	NS*
	Within Groups	15.649	114	.137			
	Total	16.667	119				
Stressful nature of work	Between Groups	4.810	5	.962	2.330	.047	S**
	Within Groups	47.057	114	.413			
	Total	51.867	119				
Biased recruitment	Between Groups	1.138	5	.228	1.162	.332	NS*
	Within Groups	22.329	114	.196			
	Total	23.467	119				
Discrimination	Between Groups	.835	5	.167	.878	.498	NS*
	Within Groups	21.665	114	.190			
	Total	22.500	119				
Low level of green job training	Between Groups	1.046	5	.209	.931	.464	NS*
	Within Groups	25.621	114	.225			
	Total	26.667	119				
Inadequate skills sets required	Between Groups	.690	5	.138	.879	.497	NS*
	Within Groups	17.901	114	.157			
	Total	18.592	119				
Sexual harassment	Between Groups	1.671	5	.334	.823	.536	NS*
	Within Groups	46.296	114	.406			
	Total	47.967	119				

Table 3 continues on the next page

Table 3 (*Continued*)

		Sum of Squares	df	Mean Square	F	P value	Sig.
Low interest from women	Between Groups	4.907	5	.981	3.237	.009	S**
	Within Groups	34.560	114	.303			
	Total	39.467	119				
Position at work	Between Groups	1.097	5	.219	.475	.794	NS*
	Within Groups	52.603	114	.461			
	Total	53.700	119				
Harsh working conditions/ environment	Between Groups	.897	5	.179	.394	.852	NS*
	Within Groups	51.903	114	.455			
	Total	52.800	119				
Low career growth/ progression	Between Groups	6.429	5	1.286	2.881	.017	S**
	Within Groups	50.871	114	.446			
	Total	57.300	119				
Lack of experience	Between Groups	1.535	5	.307	1.266	.283	NS*
	Within Groups	27.632	114	.242			
	Total	29.167	119				
Low investment in green works	Between Groups	7.046	5	1.409	2.419	.040	S**
	Within Groups	66.421	114	.583			
	Total	73.467	119				
Low pay in green jobs	Between Groups	1.840	5	.368	.813	.543	NS*
	Within Groups	51.626	114	.453			
	Total	53.467	119				

Table 3 continues on the next page

Table 3 (*Continued*)

		Sum of Squares	df	Mean Square	F	P value	Sig.
Cultural and traditional factors	Between Groups	.258	5	.052	.186	.967	NS*
	Within Groups	31.708	114	.278			
	Total	31.967	119				
Reluctance to accept women skills	Between Groups	1.971	5	.394	1.033	.402	NS*
	Within Groups	43.496	114	.382			
	Total	45.467	119				
Limited green job opportunities	Between Groups	2.917	5	.583	1.393	.232	NS*
	Within Groups	47.750	114	.419			
	Total	50.667	119				
Lack of role models in these fields	Between Groups	1.704	5	.341	1.415	.224	NS*
	Within Groups	27.462	114	.241			
	Total	29.167	119				

NS* = Not Significant, S** = Significant

being stressful in correlation with the traditional construction industry. This assessment shows women to have low interest in acquiring skills or further practice in the industry. When these two are combined, it results in women believing they cannot progress the career ladder of the construction industry. As Adeyemi et al. (2010) noted, some women construction professionals prefer to handle the secretarial and administrative part of construction rather than the brick and mortar.

In a male dominated world where preference is given to men, Oladunni (1999) observed that society has labelled certain jobs exclusively for men, which has made women go for lower paying jobs. ILO (2015) reported that women's employment status is characterized by low pay, lack of security and limited opportunity for social mobility. This is evident in the position and pay gap in most private and public sector jobs dominated by men (Aja-Okorie, 2013). The male dominant bias orientation makes women assume that the construction industry requires brute strength to carry out all its activities (Gurjao, 2008). Powell, Dainty and Bagilhole (2010) stated that this entrenched stereotype has labelled construction works a masculine environment that requires only men. Hence, the tag of a very stressful industry. Anugwom (2009) observed that this has affected women physically and psychological, seeing themselves as inadequate and unsuitable workers, thereby leading to under-performance in the workplace.

In addition, the male only image portrayed by the construction industry needs to be stopped. Dainty, Bagilole and Neale, (2000) opined that women should not be asked to choose between career and family. These choices become mandatory when women that are saddled with childcare responsibilities must cope with rigid working hours and an inadequate work-life balance that pervades the atmosphere of the industry.

Even though world-wide there has been an increase in the level of educational attainment by women compared with those of men (Hibbett and Meager, 2003), in the case of industry interest, Powell, Dainty and Bagilhole (2010) noted that women are attracted to a career based on the characteristics associated with the career. Rustico and Terzimehic (2010) reported that a major problem that ensures women are excluded from some industries is in the choice of study courses. Gurjao (2008), stated the rate at which men apply for and obtain higher education qualifications in Science, Engineering, Technology (SET) and SET-related subjects, is higher compared to their female counterparts. Rustico and Terzimehic (2010) stated that more women tend to flow into the social science and humanities courses and less to the sciences, mathematics and engineering based courses which are mainly needed in the green market jobs.

Socio-economic benefits of women inclusion in green construction

The study examined the most significant socio-economic benefits of women's inclusion in green construction. Factor analysis was the statistical tool used to achieve this purpose. Principle factor extraction analysis with Varimax rotation was performed using SPSS 17. To assess the suitability of the data for factor analysis, the KMO measure of sampling adequacy and Bartlett's test of Sphericity were conducted. Cronbach's Alpha was calculated for reliability. Table 4 showed that the KMO measure for sampling adequacy was 0.757, which is larger than 0.7, suggesting that the sample was acceptable for factor analysis. The Bartlett's test was 2390.454 and the associated significance level was p-value < 0.001, indicating that the population correlation matrix was not an identity matrix. Both tests showed that the obtained data supported the use of factor analysis. Cronbach's Alpha of 0.712 suggested that the reliability of the research instrument used was also acceptable.

Table 5 listed the eigenvalues associated with each linear component before extraction, after extraction and after rotation.

Figure 1 presented the scree plot, which resulted in three factors, because the regression line was divided into three components resulting in a close to straight line. After extraction, Factor 1 explains 26.476% of the total variance, while the second factor and third factor explains 15.593% and 12.149% respectively of the total variance.

Table 4 KMO and Bartlett's test of socio-economic benefits of female inclusion

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.757
Bartlett's Test of Sphericity:	
Approx. Chi-square	2390.454
Degree of freedom	253
Significant level	0.000

Table 5 Component transformation matrix of the Socio-economic benefits of Women's Inclusion in Green construction

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.883	34.273	34.273	7.883	34.273	34.273	6.090	26.476	26.476
2	2.869	12.475	46.748	2.869	12.475	46.748	3.586	15.593	42.069
3	1.718	7.470	54.218	1.718	7.470	54.218	2.794	12.149	54.218
4	1.444	6.280	60.498						
5	1.405	6.110	66.607						
6	1.239	5.388	71.995						
7	1.050	4.565	76.560						
8	0.929	4.037	80.938						
9	0.854	3.715	84.313						
10	0.782	3.398	87.711						
11	0.638	2.775	90.485						
12	0.488	2.122	92.608						
13	0.402	1.749	94.356						
14	0.343	1.490	95.847						
15	0.227	0.989	96.835						
16	0.191	0.829	97.664						
17	0.142	0.619	98.283						
18	0.116	0.506	98.789						
19	0.087	0.380	99.169						
20	0.071	0.308	99.477						
21	0.057	0.247	99.724						
22	0.052	0.228	99.951						
23	0.011	0.049	100.000						

Using exploratory factor analysis, three factors were extracted with eigenvalues greater than 1.0, which explained 54.22% of the total variance. The three-factor solution with respective loading scores is shown in Table 6. The factor loading of 0.70 was considered to be the cut-off point. Significantly, the research is based on the notion that no considerable development

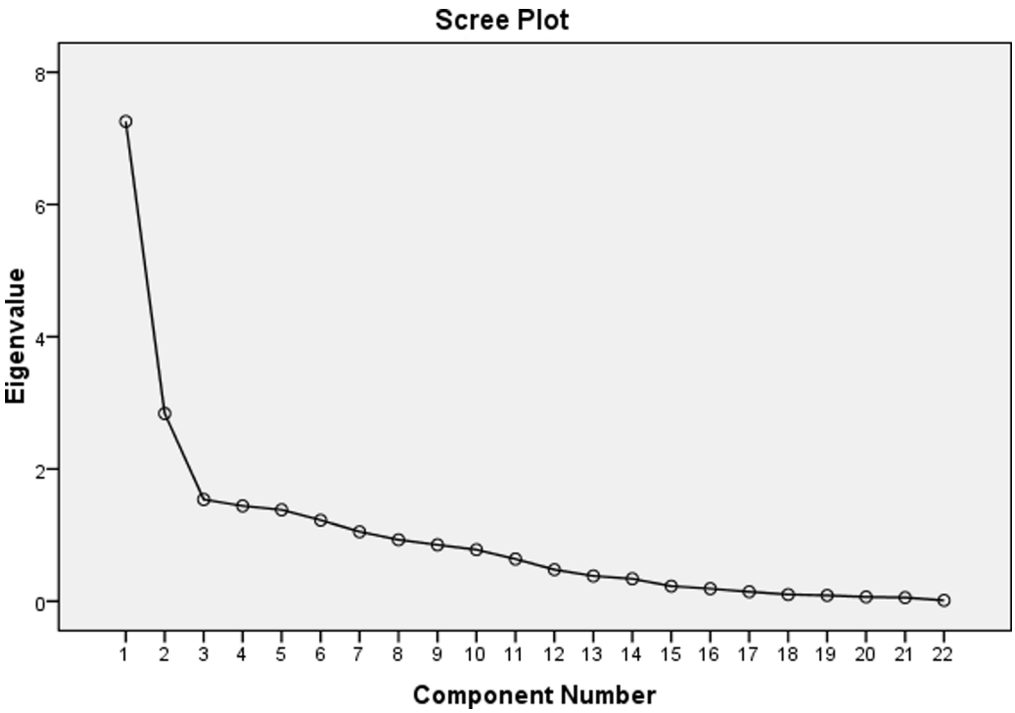

Figure 1 Scree plot for Socio-economic benefits of Women Inclusion in Green construction

Table 6 Factor loading for benefits of women's participation in green construction (Rotated Component Matrix)

Rotated Component Matrix	1	2	3
Improved family health	0.925		
Harnessing women strength and skills	0.835		
Increased participation of women in other sectors	0.735		
Improved human welfare	0.713		
Better waste generation and management		0.917	
Reduction in production and use of pollutants		0.901	
Reduction of sick building syndrome		0.899	
Better air quality		0.884	
Reduction of environmental pollution		0.840	
Increased investment in green economy		0.803	
Increased organization's and countries' commitment to cut emission		0.728	
Increased green energy market			0.836
Cheaper renewable energy solution			0.824
Cost effective solution			0.795

can be achieved without a balance in the utilization of skills and potentials possessed by both genders. Green construction that emphasizes sustainability needs diversity to thrive. ILO (2015) stated that without an inclusive gender participation that ensures growth, sustainability in a green economy cannot be achieved. In addition, Ezegbe and Akubue (2012) argued that women possess an unequal amount of potential required for national development. Koppel (2010) stated that improving the stance of women could have a commensurate impact on family unit and global basis for a sustainable economic development. From the study, three (3) main categories are attributed to identified socio-economic benefits. These are family/women related benefits, environment related benefits and the green energy market related benefits.

FACTOR 1: FAMILY/WOMEN RELATED BENEFITS

The first factor titled family/women related benefits has the largest total variance of 26.476%, and explains the benefits associated with family and women in the inclusiveness of women in green construction. This factor contains four (4) benefits associated with families and women when assessing women's inclusion in green construction. Most highlighted benefits have relatively high factor loadings (≥ 0.70). As illustrated in Table 6, the highest two benefit loading attributes of the first factor was "improved family health" and "harnessing women's strength and skill". This means that the health of members of the family is improved when women participate considerably in green construction. Children are the core of many homes and women aim to meet the needs of that intricate core. Aja-Okorie (2013) observed the significant correlation that exist between better employment of women and the family, thereby ensuring the adequacy of children's welfare. It has been noted for example, that putting more income in the hands of women yields beneficial results for general human development, as they tend to invest more in children's nutrition, health, and education (OECD 2010; World Bank 2010). As a strategy for combating poverty, hunger and diseases to achieve all other development goals, women's fair access to green jobs that are decent will not only empower them but also lead to greater and more sustainable social and economic growth (ILO, 2015). It has been noted, UNDP (2016), that in crucial roles women hold in the family and community base, they have an understanding of how to drive sustainable solutions and help curtail dangerous and harmful production and consumption patterns which have adverse effects on the ecosystem. Similarly, it can be inferred that strength and skills of women are directly improved when they are actively involved in green construction with its ability to contribute to other sectors of the economy.

FACTOR 2: ENVIRONMENT RELATED BENEFITS

The second factor is labelled environment related benefits, which is the second largest variance of 15.593% and comprises seven attributes. The first attribute with the highest factor loading is "better waste generation and management". This indicated that women's efforts can be channelled to ensuring waste is managed properly without any harmful effect on the populace. This could notably involve recycling of waste to produce reusable resources for the community. The second attribute with a high factor loading is "reduction in production and use of pollutant". Women's inclusion ensures concerted efforts are made to reduce the production and use of pollutants and therefore preserve the atmosphere and subsequently the environment. UNDP (2016) concluded that women can be engaged in the green economy approach in terms of employment, family base pattern of consumption and socio-cooperate governance

of society at large. This means that women's inclusion in green construction can engender an environmental policing system in reducing the GHG emissions in the environment.

FACTOR 3: GREEN ENERGY MARKET RELATED BENEFIT

The third factor is labelled green energy market related benefits, which has the least variance of 12.149% and comprises three attributes. The attributes with the respective factor loading are "increased green energy market", "cheaper renewable energy solution" and "cost effective solution". This indicated that women's inclusion in green construction can bring about efficient and effective green energy delivery for use in the community at large. Cost effective measures of generating and distribution of energy are expected to be mooted and hence subsequently achieved. The green energy market in Africa has persisted at a slow pace. OECD (2009) stated that financing and technology support will be essential to help developing countries reduce their GHG emissions while continuing to grow economically, and to help the most vulnerable countries adapt to the climate change that is locked-in. ILO (2015) stated that women hold key roles across society that influences how to produce, consume and market sustainable solutions. WESC (2010) suggested that national and international programs that encourage the integration of women in non-traditional roles need to be adequately funded.

Limitations of the study

The study used a questionnaire instrument which may be prone to bias and highly subjective due to the nature of the respondents. In addition, a specific gender was selected to participate in the study which does not reveal an equal or comparison view of gender equality on the subject matter. The study may have been limited in the number of variables selected in the areas of green construction participation and the barriers to women's inclusion.

Conclusion

The study examined the economics of women's inclusion in green construction. It indicated a low level of participation of women in the sixteen crucial areas in green construction. Women in construction exhibited moderate participation in Solar panel manufacturing, installation and maintenance, and in the Enforcement of environmentally friendly practices on-site. The study revealed that there are significant barriers affecting women's inclusion in green construction: the Stressful nature of construction works, Low interest from women, Low career growth/progression and Low investments in green works. In addition, the study identified three (3) socio-economic benefits of women's inclusion in green construction: Family/women related benefits (Improved family health, Harnessing women strength and skills, Increased participation of women in other sector and Improved human welfare), Environment related benefits (Better waste generation and management, Reduction in production and use of pollutants, Reduction of sick building syndrome, Better air quality, Reduction of environmental pollution, Increased investment in green economy and Increased organization's and countries' commitment to cut emission) and Green energy market related benefits (Increased green energy market, Cheaper renewable energy solution and Cost effective solution).

The study recommended that to increase female participation in the industry, young girls need to be adequately steered into less traditional roles in their career choice, through proper

guidance and awareness of different green jobs available upon graduation. Attracting women is difficult, due to the poor image of the construction industry. There is need to increase the awareness of women of the distinct features of green construction, in contrast to the general construction industry.

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