



# **WEST AFRICA BUILT ENVIRONMENT RESEARCH (WABER) CONFERENCE**

**19-21 July 2011  
Accra, Ghana**

**Keynotes, programme and abstracts  
of the WABER 2011 conference**

## **Editors**

Dr Samuel Laryea  
Dr Roine Leiringer  
Professor Will Hughes



CONSTRUCTIONAL ENGINEERS  
AND CONTRACTORS

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Keynotes, programme and abstracts of the West Africa Built Environment Research (WABER) Conference 2011  
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Dr Samuel Laryea, University of Reading, UK  
Dr Roine Leiringer, Chalmers University of Technology, Sweden  
Professor Will Hughes, University of Reading, UK

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**Declaration**

All papers in this publication have been through a review process involving initial screening of abstracts, review by at least two referees, reporting of comments to authors, modifications of papers by authors and re-evaluation of re-submitted papers to ensure quality of content.

## FOREWORD

Welcome to this year's WABER conference in Accra, Ghana. Thank you for coming and we hope you enjoy the conference. The WABER conference has developed rapidly in the past three years, but our aims remain the same. We strive to: help young built environment researchers in West Africa (WA) to develop their research work and skills through constructive face-to-face interaction with their peers and experienced international academics; supply a platform for interaction among more senior academics and an outlet for disseminating their research work; and to serve as a vehicle for developing the built environment field in Africa.

Three conferences have so far been organized, 2009-2011, bringing together nearly three hundred academics, researchers and practitioners from 50+ different institutions in WA. Through WABER, many young researchers have been helped to develop their research work and skills through constructive face-to-face interaction with experienced academics. We find this encouraging and we will continue to work together with colleagues in WA to develop initiatives that provide young researchers in WA with opportunities to develop their research potential and aspirations.

This year's conference proceedings consist of 95 papers. This represents around 50 percent of abstracts and full papers that were initially submitted. We congratulate the authors of papers that made it into the proceedings for a job well done. The published papers cover a wide array of topics including: Building services, Construction design and technology, Construction economics and finance, Construction education, Construction materials and production, Contracts, Cost and financial management, Energy generation and consumption, Engineering sciences, Facilities management, Health and safety, Housing, Human resources and skills, Information technology, Materials science, Procurement, Project administration and management, Quantity surveying, Real estate and planning, Risk management, Supply chain management, Sustainable technologies, Urban planning and development, Waste management. As such they reflect various areas of socio-economic development aspirations of countries in West Africa. One thing that is strikingly clear is that the construction sector has an important part to play in helping to realize these aspirations.

We hope that the publication and discussion of these papers at this conference will contribute towards the development of knowledge and technologies for development in West Africa and beyond. Given that the delegates at this year's conference come from 10 different countries and 45 different academic institutions, there is plenty of scope for cross boundary interaction and learning. The conference also provides for a rich intellectual, international and multicultural blend and platform for networking and developing new knowledge, connections and longer-term collaborations. We hope that the delegates make good use of this opportunity.

We wish to express strong appreciation to two companies in Ghana who have supported us financially. The first is A-Kon Consults Limited who are Chartered Quantity Surveyors with head office based in Accra. The second is K+H Limited who are Constructional Engineers and Contractors with head office based in Takoradi. We are grateful for your support and input and we look forward to a mutually beneficial long-term relationship.

We are blessed to have four distinguished Keynote Speakers: Professor George Ofori (National University of Singapore); Dr Roine Leiringer (Chalmers University, Sweden); Dr Chris Harty (University of Reading, UK); and Professor Will Hughes (University of Reading, UK). Thank you very much for coming. As always, many thanks are due to Dr Sena Agyepong for her excellent and capable management of our local organizing arrangements. Above all, thank you to all of you for coming to this conference. Our conference next year (2012) will take place in Nigeria and we look forward to seeing all of you again. Enjoy Accra and have a safe journey back home.

Dr Samuel Laryea  
School of Construction Management and Engineering  
University of Reading, July 2011

## **SCIENTIFIC COMMITTEE**

Professor Will Hughes, University of Reading, UK  
Professor George Ofori, National University of Singapore, Singapore  
Dr Chris Harty, University of Reading, UK  
Dr Sena Agyepong, Central University, Ghana  
Dr Scott Fernie, Heriot-Watt University, UK  
Professor George W.K. Intsiful, KNUST, Kumasi, Ghana  
Dr Martin M. Tuuli, Loughborough University, UK  
Professor Denis F. Cioffi, George Washington University, USA  
Professor Anny Nathaniel Aniekwu, University of Benin, Nigeria  
Dr Mrs Bola Babalola, Obafemi Awolowo University, Nigeria  
Professor Kabir Bala, Ahmadu Bello University, Nigeria  
Cathy Hughes, University of Reading, UK  
Professor Raymond Nkado, University of the Witwatersrand, South Africa  
Dr Felix Hammond, University of Wolverhampton, UK  
Professor K.T. Odusami, University of Lagos, Nigeria  
Dr Aaron Anvuur, University College London, UK  
Dr Emmanuel Adinyira, KNUST, Kumasi, Ghana  
Professor Stella Zubairu, Federal University of Technology, Minna, Nigeria  
Dr Kemi Adeyeye, University of Brighton, UK  
Dr Paul Alagidede, University of Stirling, Scotland  
Rev. Dr. Frank Fugar, KNUST, Kumasi, Ghana  
Dr Nongiba A. Kheni, Tamale Polytechnic, Ghana  
Dr Nii Ankrah, University of Wolverhampton, UK  
Dr Tyler Frazier, Technische Universität Berlin, Germany  
Dr Wisdom Kwawu, University of Reading, UK  
Dr Franklin Obeng-Odoom, University of Sydney, Australia  
Mrs. Paula Cardellino, Universidad ORT Uruguay, Montevideo, Uruguay  
Dr Ajibade Ayodeji Aibinu, University of Melbourne, Australia  
Dr Wellington Didibhuku Thwala, University of Johannesburg, South Africa  
Dr Ola Uduku, Edinburgh College of Art, Scotland  
Professor Jianguo Chen, Tongji University, China  
Dr Emmanuel Adu Essah, University of Reading, UK  
Dr Roine Leiringer, Chalmers University of Technology, Sweden  
Dr Samuel Laryea, University of Reading, UK

## REVIEW PANEL

In addition to the members of our scientific committee, the following people have helped to review abstracts and papers for the conference and we would like to acknowledge their contribution and thank them.

Dr. Moshood O. Fadeyi, British University in Dubai, UAE  
Josip Sertic, University of Zagreb, Croatia  
Yingbin Feng, University of Western Sydney, Australia  
Dr Li Shan, Department of Building, National University of Singapore, Singapore  
Dr Hasan Haroglu, University of Reading, UK  
Dr Richard Nyuur, University of Swansea, Wales  
Mr. Igor Martek, University of Melbourne, Australia  
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Patrick Manu, University of Wolverhampton, UK  
Damilola Ekundayo, Northumbria University, UK  
Ms Ma Shichao, The University of Hong Kong  
Tangi Rebekka Amakali, University of Reading, UK  
Dr Bekithemba Mpofu, College of Estate Management, UK  
Sarfo Mensah, Kumasi Polytechnic, Ghana  
Funlola Famuyiwa, University of Lagos, Nigeria  
Dr De-Graft Owusu-Manu, KNUST, Kumasi, Ghana  
Dr Stephen Kong, Civil Engineering and Development Department, Hong Kong  
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Ms Chuanjing Ju Carrie, The University of Hong Kong  
Dr Rita Li, Hong Kong Shue Yan University  
Dr. Alan Zhai, China Harbour Engineering Company Ltd  
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Mr Zhang Yu, The University of Hong Kong  
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Mr John Shen Yuzhong, The University of Hong Kong  
Dr Hao Wu, University of Melbourne, Australia  
Dr. Raglan Lam, Raglan Ltd, Hong Kong

## **THEME LEADERS**

We are grateful to the following academics for leading the refereeing process for papers relating to the research areas designated against their name(s):

Dr Franklin Obeng-Odoom, University of Sydney, Australia  
Housing, land use and urban economic development, urbanisation

Dr Aaron Anvuur, University College of London, UK  
Organisation strategy and supply chain management

Dr Martin Tuuli, Loughborough University, UK  
Quantity surveying, cost and financial management

Dr Sena Agyepong, Central Univeristy, Ghana  
Human resources and skills

Dr Kemi Adeyeye, University of Brighton, UK  
Construction design and technology

Dr Tyler Frazier, Technische Universität Berlin, Germany  
Urban infrastructure planning, land development regulations, real estate price modeling

Dr Wisdom Kwawu, University of Reading, UK  
Facilities management

Dr Roine Leiringer, Chalmers University, Sweden

Dr Samuel Laryea, University of Reading, UK  
Procurement, contracting and risk management

Dr Ajibade Ayodeji Aibinu, University of Melbourne, Australia  
Contract administration

Dr Emmanuel Adu Essah, University of Reading, UK  
Solar energy systems, sustainable technologies, building services

# PROGRAMME

**TUESDAY 19 JULY 2011 - 08:00-17:30**

## **08:00-09:00 REGISTRATION**

### **OPENING SESSION**

- 09:00-09:10 Welcome address by *Mr. Moses Anibaba* (Director of British Council in Ghana): *Role of the British Council in Africa*
- 09:10-09:15 Opening remarks by *Professor Will Hughes* (Editor-in-chief of Construction Management and Economics; and Professor of Construction Management and Economics, University of Reading, UK)
- 09:15-09:25 Guest of Honour address by *Hon. Samia Nkrumah* (MP, Parliament of Ghana)  
Title of address: “*Role of the built environment community in the development of societies in Africa*”
- 09:25-09:35 Chairman’s remarks by *Mr. Nat Amarteifio* (Architect and Former Mayor of Accra)
- 09:35-09:45 Official WABER 2011 Group Photograph

### **KEYNOTE ADDRESS**

- 10:00-10:05 Introduction of keynote address/speaker by Mr Samuel Asare-Konadu, MD of A-Kon Consults Ltd
- 10:05-10:30 A-Kon Consults Keynote address by Professor Will Hughes (Professor of Construction Management and Economics, University of Reading, UK; Editor-in-chief of Construction Management and Economics journal)  
*Title: Academic profile and conflicting agendas: individuals, departments, universities, journals, industry*
- 10:30-10:40 Q&A
- 10:40-11:00 **Refreshments and networking break**

### **WORKSHOP SESSION (11:00-13:00)**

#### **Chairperson Dr Ola Uduku (Edinburgh College of Art School of Architecture, Scotland)**

- 11:00-11:10 Managing the adverse health and safety influence of subcontracting – Patrick Manu, Nii Ankrah, David Proverbs, Subashini Suresh and Emmanuel Adukpo
- 11:10-11:20 A review of the current health and safety legislation in Botswana relative to construction industry stakeholders – Erastus Mwanaumo and Wellington Thwala
- 11:20-11:40 Discussion
- 11:40-11:50 Identification of health and safety performance improvement measuring indicators – Justus Agumba, Wellington Thwala and Theo Haupt
- 11:50-12:00 Investigating the perceptions of architects in the Ghanaian building industry with regard to photovoltaic energy technology – Naa Adjeley Ashiboe-Mensah, Fred Akuffo and Frank Fugar
- 12:00-12:20 Discussion
- 12:20-12:30 Exploring waste minimization measures in the Ghanaian construction industry – J Ayarkwa, K Agyekum and E Adinyira
- 12:30-12:40 Designing out waste on mass housing construction sites in Minna, Niger state – Oluwatoyin Ayodeji Olaniyan
- 12:40-13:00 Discussion
- 13:00-14:00 **Lunch and networking break**

## KEYNOTE ADDRESS

- 14:00-14:30 Keynote address by Professor George Ofori (National University of Singapore, Singapore)  
*Title: A review of construction industry development programmes*
- 14:30-14:40 Q&A
- 14:40-15:00 **Networking break**

## WORKSHOP SESSION (15:00-17:30)

### Chairperson **Dr Esi Ansah (Ashesi University, Ghana)**

- 15:00-15:10 Urbanisation and the marketplace in West African countries – Enitan Oloto and Kayode Adebayo
- 15:10-15:20 Reinventing prototype buildings: The significance of prefabrication in mass housing construction – Lateef Lawal
- 15:20-15:40 Discussion
- 15:40-15:50 Gender issues in land: Implications for housing development in Nigeria – Ajayi Adebola
- 15:50-16:00 Urban land use planning in Ghana - Kwasi Awuah, Felix Hammond, Colin Booth and Jessica Lamond
- 16:00-16:20 Discussion
- 16:20-16:30 Hydrological performance of rainwater harvesting system in the residential sector – Omolara Lade, David Oloke, Collin Booth, Michael Fullen and David Proverbs
- 16:30-16:40 The likely effect of sustainable landscape on the quality of life through tourism – Dorcas Ayeni, O.J. Ebohon and A.H. Taki
- 16:40-17:00 Discussion
- 17:00-17:10 Innovative approaches to sustainable built environments in Nigeria – Chinwe Sam-Amobi
- 17:10-17:20 Framework analysis of technology and design of sustainable affordable housing in Nigeria - Olatunji Olagunju, David Oloke, Felix Hammond and Pat Costello
- 17:20-17:30 Discussion
- 17:30 Close

## SOCIALISING

- 19:30 Socialising at the new Movenpick Ambassador Hotel in Accra City Centre**  
**[http://www.moevenpick-hotels.com/en/pub/your\\_hotels/worldmap/accra/overview.cfm](http://www.moevenpick-hotels.com/en/pub/your_hotels/worldmap/accra/overview.cfm)**

## **WEDNESDAY 20 JULY 2011 - 09:00-17:30**

### **RESEARCH SKILLS WORKSHOP (MAIN AUDITORIUM)**

09:00-10:30 Data collection and analysis: what is data, how do you collect it, and how do you analyse it? – Dr Chris Harty (School of Construction Management and Engineering, University of Reading, UK)

10:30-11:00 **Refreshments and networking break**

### **PARALLEL SESSIONS (11:00-13:10)**

#### **STREAM 1 (MAIN AUDITORIUM)**

**Chairperson Dr Martin M. Tuuli (Loughborough University, UK)**

11:00-11:10 Energy generation and consumption in Ghana – Emmanuel Essah

11:10-11:20 Industrial training in Ghana: perceptions of the undergraduate construction student – J. Ayarkwa, E. Adinyira and K. Agyekum

11:20-11:30 Discussion

11:30-11:40 Factors affecting women enrolment in construction education in Nigeria – Joshua Dada

11:40-11:50 Built environment education and research in West Africa – Samuel Laryea

11:50-12:00 Discussion

**Chairperson Professor Joshua Ayarkwa (KNUST, Kumasi, Ghana)**

12:10-12:20 Causes of variations on building projects in Nigeria – J.A. Babalola and A.F. Idehen

12:20-12:30 On the accuracy of cost estimates – Haruna Musa, Yahaya Ibrahim and Ahmed Ibrahim

12:30-12:40 Discussion

12:40-12:50 A comparative analysis of clients' and consultants' perspective of construction project performance – William Gyadu-Asiedu

12:50-13:00 Performance of building projects funded by public organizations – Sarfo Mensah, Ayirebi Dansoh and Peter Amoah

13:00-13:10 Discussion

13:10-14:30 **Lunch and networking break**

#### **STREAM 2 (SEMINAR ROOM)**

**Chairperson Dr Noah Karley (Heriot Watt University, Scotland)**

11:00-11:10 A comparative study of housing transformation processes in three government estates in South Western, Nigeria – Victor Adegbehingbe

11:10-11:20 An overview of human settlement in Nigeria: A ray of hope for the slum dwellers? – Clinton Aigbavboa and Wellington Thwala

11:20-11:30 Discussion

11:30-11:40 Affordability assessment of the housing units built from federal mortgage bank's loans in Nigeria – Musa Nuhu Madawaki

11:40-11:50 Public-private participation in housing in Nigeria and the case for community participation – Abraham Taiwo and Olumuyiwa Adegun  
11:50-12:00 Discussion

**Chairperson Professor Kabir Bala (Ahmadu Bello University, Nigeria)**

12:10-12:20 Historical overview of housing provision in pre and post independence Ghana – T. Kwofie, E. Adinyira and E. Botchway  
12:20-12:30 House owners’ participation in mass housing provision in Niger State Nigeria – Adedayo Folaranmi  
12:30-12:40 Discussion  
12:40-12:50 Framework for performance-based post-occupancy evaluation of educational institution buildings in Nigeria – Aliyu Shika and Abubakar Dardau  
12:50-13:00 Post occupancy evaluation of public office buildings in Minna urban – Ayoola Babatunde, Ayo Adeniran and Kemiki Olurotimi  
13:00-13:10 Discussion  
13:10-14:30 **Lunch and networking break**

**KEYNOTE ADDRESS (MAIN AUDITORIUM)**

14:30-14:55 K+H Ltd Keynote address by Dr Roine Leiringer (Chalmers University, Sweden)  
*Title: Built environment research in West Africa: current trends and future directions*  
14:55-15:05 Q&A

**PARALLEL SESSIONS (15:10-17:30)**

**STREAM 1 (MAIN AUDITORIUM)**

**Chairperson Dr Emmanuel Olufemi Omisore (Obafemi Awolowo University, Nigeria)**

15:10-15:20 Jos plateau volcanic deposits as sustainable cementitious materials for partial replacement of Portland cement in concrete mixtures  
15:20-15:30 Effect of replacement of sand with granite fines on the compressive and tensile strengths of palm kernel shell concrete – John Babafemi and Babatunde Olawuyi  
15:30-15:40 Discussion  
15:40-15:50 Effects of Nigerian rice husk ash produced using a charcoal fired incinerator on properties of cement mortar and concrete – A.E. Abalaka, O.G. Okoli, M.M. Garba and I.K. Zubairu  
15:50-16:00 Establishing the compressive strength of sandcrete blocks produced in the Central Region, Ghana – Emmanuel Bamfo-Agyei  
16:00-16:10 Discussion  
16:10-16:30 **Networking break**

**Chairperson Dr Victor Adegbehingbe (Federal University of Technology, Akure, Nigeria)**

16:30-16:40 Factors influencing the extensive use of glass on facades of office buildings in Accra, – Adwoa Difie Ampadu-Asiamah and Emmanuel Akoi-Gyebi Adjei  
16:40-16:50 Cost implications of biodegradation of Khaya grandifoliola (dry land mahogany) by aspergillus spp in residential buildings – I.H. Mshelgaru and A.D. Abdulazeez  
17:00-17:10 Discussion  
17:00-17:10 Establishing a maintenance cost profile of residential buildings – D. O. Mac-Barango and I. I. Kakulu  
17:10-17:20 Drivers for estimating construction costs of institutional building projects in Nigeria – Baba Waziri and Kabir Bala  
17:20-17:30 Discussion  
17:30 Close

## **STREAM 2 (SEMINAR ROOM)**

### **Chairperson Mrs Mae-ling Lokko / Joe Osaе-Addo (Constructs LLC, Ghana)**

- 15:10-15:20 Merging architectural and sculptural forms in the building industry - Victor Kweku Bondzie Micah and Owusu-Ansah Ankra  
15:20-15:30 Client-architect behaviours towards cost advice in Nigeria – Baba Adama Kolo, Badiru Yunusa and Anita Dzikwi  
15:30-15:40 Discussion  
15:40-15:50 Designs and construction of buildings in Ghana: The disability factor – Kwaku Owusu and Nana Buabeng Owusu-Ansah  
15:50-16:00 Bioclimatic and design strategies analysis towards the improvement of comfort in semi-detached houses in Ghana - David Nyame-Tawiah, Christian Koranteng and Adeline Mawupemor Woyome  
16:00-16:10 Discussion  
16:10-16:30 **Networking break**

### **Chairperson Dr Sena Agyepong (Ashesi University, Ghana)**

- 16:30-16:40 An evaluation of the trend of budgetary allocations for infrastructural development in Osun state, south-western, Nigeria – Opawole Akintayo, Jagboro Onajite and Babatunde Olusola  
16:40-16:50 Constraints in real estate development finance in Ghana – Nkyi Benjamin Appiagyei and Ayirebi Dansoh  
17:00-17:10 Discussion  
17:00-17:10 Remittances to Ghana: Benefits to the housing sector and impact of financial crisis – Noah Kofi Karley  
17:10-17:20 Spatial scales and measurement of housing values in Nigeria – Ola Aluko  
17:20-17:30 Discussion  
17:30 Close

## **SOCIALISING**

- 19:30 Socialising at Alisa Hotel in North Ridge Accra**  
<http://www.alisahotels.com/>

**THURSDAY 21 JULY 2011 - 09:00-17:30**

## **WORKSHOP SESSION**

**Chairperson Professor G.W.K. Intsiful (KNUST, Kumasi, Ghana)**

- 09:00-09:10 Sources of deficient information regime in urban real estate markets in Sub-Saharan African countries – Stanislaus Adiaba, Felix Hammond, David Proverbs, Jessica Lamond and Colin Booth
- 09:10-09:20 Public private partnership (PPP) in housing delivery in Niger State – Suleiman Bolaji
- 09:20-09:30 An integrated relationship and supply chain management framework for improving engineering and design service delivery to building contractors in Ghana – Nanyi Orgen, Divine Ahadzie, Joshua Ayarkwa, Edward Badu
- 09:30-09:50 Discussion

## **PARALLEL SESSIONS (10:00-13:10)**

### **STREAM 1 (MAIN AUDITORIUM)**

**Chairperson Dr Wellington Didibhuku Thwala (University of Johannesburg, South Africa)**

- 10:00-10:10 Casual workers preference of occupational health and safety items on building construction sites in Ghana – Frederick Owusu Danso, Edward Badu and Divine Ahadzie
- 10:10-10:20 Influence of construction site OHS facilities on OHS performance in Nigeria – Godwin Idoro
- 10:20-10:30 Discussion
- 10:30-10:40 Health and safety in Ghanaian construction industry – A. Nimo Boakyee, B.B. Akomah and David Coles
- 10:40-10:50 How should health and safety be measured as a tender evaluation criterion in the Ghanaian construction industry? – Wise Akortsu
- 10:50-11:00 Discussion
- 11:00-11:30 **Refreshments and networking break**

**Chairperson Dr Emmanuel Essah (University of Reading, UK)**

- 11:30-11:40 Sustainable construction in Nigeria – James Jatau and Anthony Westcott
- 11:40-11:50 “Sustainable” or “green” construction in Lagos, Nigeria – Immaculata Nwokoro and Henry Onukwube
- 11:50-12:00 Discussion
- 12:10-12:20 Sustainable tourism architecture – Stephen Oluigbo
- 12:20-12:30 Malaika Children’s Village, Mkuranga, Tanzania: A case study of sustainable construction in Africa - Ifeyinwa Dimoriaku and Rita Obiozo
- 12:30-12:40 Discussion
- 12:40-12:50 The thermal performance of an educational office building in Ghana - Jimmy Nkrumah, Christian Koranteng and Kojo Safo-Kantanka
- 12:50-13:00 A study of the sources of noise pollution and their impacts on the built environment – S.A. Ganiyu and Y.M.D. Adedeji
- 13:00-13:10 Discussion
- 13:10-14:30 **Lunch and networking break**

## **STREAM 2 (SEMINAR ROOM)**

### **Chairperson Dr Nii Ankrah (University of Wolverhampton, UK)**

- 10:00-10:10 Dynamics of empowerment in projects – Enoch Sackey, Martin Tuuli and Andy Dainty  
10:10-10:20 Influence of channels of recruitment on performance of construction workers in Nigeria – Godwin Idoro and Ebenezer Bamidele  
10:20-10:30 Discussion  
10:30-10:40 Capacity-building in contract administration: key to effective utilization of District Assembly Common Fund – M Boadu, J Eshun and E Opoku-Ware  
10:40-10:50 Leader influences on training effectiveness of construction professionals - Henry Onukwube  
10:50-11:00 Discussion  
11:00-11:30 **Refreshments and networking break**

### **Chairperson Dr Gabriel Nani (KNUST, Kumasi, Ghana)**

- 11:30-11:40 Geosopic perspective in Yoruba urbanism – Olaniyi Okedele and Tunji Adejumo  
11:40-11:50 Factors influencing land accessibility for housing development in Abuja, Nigeria – Andrew Stanley and O. Orobowale  
11:50-12:00 Discussion  
12:10-12:20 Assessment of patronage of Natural History Museum, Obafemi Awolowo University, Ile-Ife, Nigeria - Emmanuel Olufemi Omisore  
12:20-12:30 Revitalization of Nigerian urban centres through effective use of open public spaces: a case study of Onitsha metropolis – N Okolo, C Okpala, K Ezeji and A Okolie  
12:30-12:40 Discussion  
12:40-12:50 Mining activities in Nigeria urban environment: Impetus for community development or environmental deterioration? – Samson Adeyinka, Albert Abegunde, Nathaniel Adeoye, S. Adeyemi  
12:50-13:00 An investigation into the Environmental Protection Agency in the Ghanaian construction industry – E. Opintan-Baah, P.P. Yalley, P. Kwaw and G. Osei-Poku  
13:00-13:10 Discussion  
13:10-14:30 **Lunch and networking break**

## **PARALLEL SESSIONS (14:30-16:40)**

## **STREAM 1 (MAIN AUDITORIUM)**

### **Chairperson Professor Will Hughes (University of Reading, UK)**

- 14:30-14:40 An investigation on why adjudication is not a popular dispute resolution method in the Ghanaian construction industry – Eric Baffour-Awuah, Charles Vroom and Peter Otchere  
14:40-14:50 Management of building construction disputes in Nigeria – Henry Onukwube  
14:50-15:00 Discussion  
15:00-15:10 Challenges facing the smooth implementation of Ghana's Public Procurement Law, 2003, Act 663 – Collins Ameyaw, Sarfo Mensah and Ernest Osei-Tutu  
15:10-15:20 Assessing the impact of the National Building Regulation, 1996, L.I.1630 in Ghana – John Dadzie and David Coles  
15:20-15:30 Discussion

### **Chairperson Professor Okedele Olaniyi (University of Lagos, Nigeria)**

- 15:40-15:50 An investigative study of the impact of distance and demographic variables on the price of cement – D.O. Mac-Barango  
15:50-16:00 Diesel (Ago) pump price increase and the prices of selected building materials in Nigeria (1990–2009) – John Idiake  
16:00-16:10 Discussion  
16:10-16:20 Partnering: an alternative contractual arrangement for construction project delivery in Ghana – Samuel Ansah  
16:20-16:30 Evaluating the benefits of BOT infrastructure projects in Nigeria – Alhassan Dahiru and S. Bustani  
16:30-16:40 Discussion

### **STREAM 2 (SEMINAR ROOM)**

#### **Chairperson Dr Chris Harty (University of Reading, UK)**

- 14:30-14:40 Critical success factors for the implementation of Total Quality Management (TQM) in real estate development in Ghana – Kobina Imbeah and Ayirebi Dansoh  
14:40-14:50 Investigation into the use of Total Quality Management in Nigerian construction industry – Peter Gangas Chindo and Kulomri Adogbo  
14:50-15:00 Discussion  
15:00-15:10 Construction participants' perspective on multi-criteria selection practice in Lagos State, Nigeria – Folasade Alabi  
15:10-15:20 Influence of IT use at pre-contract stage of construction projects in Akwa Ibom State Nigeria – Jimmy Wilson and Godwin Idoro  
15:20-15:30 Discussion

#### **Chairperson Rev. Dr Frank Fugar (KNUST, Kumasi, Ghana)**

- 15:40-15:50 Security measures adopted by estate surveyors shopping malls in Kaduna, Nigeria - David Ayock Ishaya and Daniel Dabo  
15:50-16:00 Enhancing the image of transport terminals in Ghana – Peter Yalley, Gloria Osei Poku and Harold Adjarko  
16:00-16:10 Discussion  
16:10-16:20 Clay exploration, aesthetics and environmental sustainability: a case study of Akure and Ado-Ekiti, Nigeria – Ganiyu Sulayman Olubunmi and Ganiyu Sikiru Abiodun  
16:20-16:30 Impact of improper solid waste disposal on urban housing in Akure, Nigeria – Alexander Fakere and Olaniyi Aluko  
16:30-16:40 Discussion

### **CLOSING SESSION**

- 16:45-17:00 Conference summary – Dr Roine Leiringer  
17:00-17:30 Presentation of certificates and prizes – Professor Will Hughes  
17:30 **Close and refreshments**

### **SOCIALISING**

- 19:30 Socialising at Novotel Hotel in Accra City Centre**  
**<http://www.novotel.com/gb/hotel-1021-novotel-accra-city-centre/index.shtml>**

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## **SECTION 1: KEYNOTES**



# ACADEMIC PROFILE AND CONFLICTING AGENDAS: INDIVIDUALS, DEPARTMENTS, UNIVERSITIES, JOURNALS, INDUSTRY

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This presentation covers the conflicting agendas and pressures that beset the academic. We are all members of diverse constituencies, as individuals, members of departments and faculties, members of a university, authors and referees in journals and, to varying degrees, contributors to industry. Universities have a distinctive task. As Edward Shils has said, “it is the methodical discovery and teaching of truths about serious and important things”.

A “scientific” truth is not the same as a religious truth. One is relative, the other absolute. Science is no more than a provisional consensus. It involves the observation of certain specific phenomena within a theoretical framework in order to develop better explanations that improve our collective understanding. It is not the mere reporting of phenomena - i.e. science is not journalism. The focus on academic outputs relates to an intensifying search for recognition in the wider disciplinary community, as well as to competition for promotion. The conflicting agendas require academics to produce “multi-purpose papers” which fulfil several functions: they record scientific progress in the field, they create the sense of a “bundle of knowledge” or community of specialist scholars, they develop wider recognition in the academic community, they provide evidence for promotion cases. But academic outputs are not journalism and not dissemination, therefore not necessarily directly useful for industry.

To ensure that academic outputs are robust, they are peer evaluated. This involves questioning whether a paper makes a satisfactory contribution. Editors seek to encourage the exercise of judgement in their referees but referees do not decide the fate of the paper, editors do. Institutional pressures mean that a rational response is needed to the combined impact of increasing costs and decreasing income. This means an ever sharper dependence on league tables, rankings and evaluations of “impact”. There is a universal problem of measurement, which is that you tend to only get what you measure. Any individual academic has to decide where to publish. It is necessary to develop a publication strategy that is most likely to measure up in terms of impact factors, league tables but this tends to transform the motivation to publish from reporting the results of research to demonstrating research-active status. But for an individual, the important thing is placing papers with peers.

In the area of built environment research, there are some important and difficult questions: Are practitioners and academics too close or too distant? What is the business case for funding research? Indeed, what is the business case for funding journals? There is a tendency for these pressures to re-write the academic agenda. Therefore, how should we respond? There is a choice between institutional and ethical responses. Is the agenda career-building or institution-building? There are clearly consequences that depend on the mode of measurement. And there are common misconceptions of relationship between quality and quantity. For example, is there a choice between developing new insights and making money?

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In conclusion, what helps us to progress in our careers is peer recognition. What makes us useful to departments and universities is recognition and impact. What makes a scientific paper useful is conformance with the customs and practice of the particular academic field. What makes academics useful to industry is being able to provide practical and positive advice. There are many conflicting agendas, in response to which the successful academic has to develop diverse tactics.

# DEVELOPING THE CONSTRUCTION INDUSTRY: A DECADE OF CHANGE IN FOUR COUNTRIES

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The report on the UK construction industry entitled *Rethinking Construction* which was written by a task force led by Sir John Egan (1998) inspired the construction industries in many parts of the world to carry out comprehensive reviews of the industries. Although there are similarities in the programmes of the countries, they were shaped by different institutional contexts, and their implementation faced different problems and challenges. Despite the extensive literature on change initiatives in each of the countries, there is hardly any international comparison of the programmes. The background to, and implementation of, the construction industry reform studies in the UK, Singapore, Hong Kong, and Malaysia are presented. The achievements realised, and challenges faced, in each country are discussed. The potential contribution which researchers can make and the merits of international research collaboration are highlighted.

Keywords: change, construction industry development, contextual constraints, international research collaboration.

## INTRODUCTION

In the past decade, a number of studies have focused on reviewing the construction processes, practices, and performances in their countries. The studies have focused on how to re-engineer, reinvent, revalue, and rethink construction to improve its performance. The Egan Report (1998) inspired the initiation of construction industry reviews in several other countries. These include the Construction 21 (C21) study in Singapore (Construction 21 Steering Committee, 1999) and the *Construct for Excellence* report in Hong Kong (CIRC, 2001). Subsequently, in Malaysia, the Construction Industry Development Board (CIDB) and the Building Industry Presidents Council (BIPC) proposed recommendations and action plans to overcome the challenges faced by the construction industry, in the form of the Construction Industry Master Plan (CIMP) (CIDB, 2007). The reports produced from the studies have become blueprints on which programmes for the development of the respective construction industries have been based.

A joint research project is currently being undertaken on the change programmes for the construction industries in the UK, Singapore, and Hong Kong, to compare the objectives of the construction industry change programmes, and the outcomes from, their implementation. and the institutional characteristics of the construction industries in the three jurisdictions are also being studied. There were key similarities and

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differences among the three programmes. All three studies were intended to attain a radical transformation of construction industry performance through a planned series of change initiatives. Performance targets relating to each of the recommendations were also set. However, the three reports were shaped by very different sets of local concerns. They also advocated different institutional arrangements for implementing the desired changes. Hence, it is possible to draw lessons from the three implementation programmes for future construction industry improvements in each jurisdiction and in other countries as well.

The background of construction industry improvement programmes in the UK, Singapore, Hong Kong and Malaysia is presented. Overviews of the progress which has been attained under the respective programmes in each country are then provided. The similarities and differences of the development among the four countries are discussed. The perceived future of the construction industry in Singapore is presented as a case study.

### **Objectives of paper**

A joint study is being undertaken on construction industry development by teams from the University of Hong Kong, University of Reading and National University of Singapore. The collaboration involves the utilisation of a jointly developed research method. Box One shows the aim and objectives of the joint research.

*Box One Collaborative research on industry development initiatives: Research aims and objectives*

Research aims and objectives

The aim of the collaborative research is to study the implementation of the respective construction industry improvement programmes in Hong Kong, Singapore and the UK. The objectives are:

- To compare the institutional characteristics of the construction industries in Hong Kong, Singapore and the UK.
- In light of the above, to ascertain and evaluate the extent to which the respective implementation programmes have achieved the objectives set.
- To evaluate the respective roles of government and private sector agencies in the implementation of the advocated reforms.
- To draw lessons from the three implementation programmes for future industry improvements in each context.
- To develop a research agenda for contributing to the effort to realise improvements in the construction industries of the three locations in addition to other national/regional contexts.
- To present specific, tailored recommendations for the use of performance targets, with particular emphasis on appropriateness and monitoring.

Box Two presents the agreed research method which was adopted by the partners. In Singapore, the study involved the following stages: (a) interviews of prominent practitioners and administrators who were involved in the C21 process; (b) an extensive industry-wide questionnaire survey of developers, consultants (architects, engineers and quantity surveyors), contractors, subcontractors; (c) joint research workshop and conference (in Singapore) on the future of construction in Singapore; and (d) forum of construction industry leaders. The forum replaced the case studies which had been part of the original programme, after it became apparent that such case studies were unlikely to yield the desired results in the particular context of the construction industry in Singapore.

## **CONSTRUCTION INDUSTRY IMPROVEMENT PROGRAMMES IN FOUR COUNTRIES**

This section provides an overview of the background of construction industry improvement programmes in each of the four countries, in chronological order of the year of publication.

## IMPROVEMENT PROGRAMME IN THE UNITED KINGDOM

In the UK, the construction industry has been perceived as under-achieving, in terms of meeting its own needs and those of its clients. Hence, a Construction Task Force was set up to advise the Deputy Prime Minister (from the clients' perspective) on the opportunities to improve the efficiency and quality of delivery of UK construction, to reinforce the impetus for change, and to make the industry more responsive to customer needs.

### *Box Two Collaborative research on industry development initiatives: Research method*

The research adopts a multi-method of 'contextualist research' which emphasises the importance of locating present behaviour in the context of its historical antecedents (Pettigrew, 2003). Of particular importance is to focus on the dynamics of change in the three jurisdictions under consideration. Few current researchers within the context of construction management give significant attention to time, with the result that much of their work is an 'exercise in comparative statics'. In contrast, the research approach would recommend that researchers follow the approach of historians to 'reconstruct past contexts, processes, and decisions' in order to discover patterns, find underlying mechanisms and triggers, and combine inductive search with deductive reason (Orton, 1997). An important underlying principle is that the context within which change is instigated must be conceptualised as an active part of analysis (Ferne et al., 2007). But context is not only *shaping*, it is also *shaped* by action (Pettigrew, 1997). The advocated research approach will unpack how the three contexts have been shaped over time and the influence that this has had on the implementation of the respective change agendas. The research differs that it adopts a 'becoming ontology' rather than a 'being ontology' (Chia, 1995). As such it focuses on continuous processes of flux and transformation, rather than static characteristics that can be possessed and measured.

The research involves the following stages:

Comparative analysis of pre-existing dynamics of sectoral change in the three locations. This will involve an historical analysis of available statistics and published sources.

Archival studies and review of literature on performance-improvement initiatives in each location to provide the basis for the formulation of the questionnaire

Empirical studies in the three locations, comprising.

Workshops with prominent practitioners and policy makers (i) to verify the outputs from stages (1) and (2) and to identify emergent issues.

A questionnaire survey using a common set of questionnaire, adapted in each case to suit the local context

A series of semi-structured interviews with prominent practitioners and policy makers in each location.

Five detailed case studies of indicative firms in each location, with particular emphasis on the interaction between the firms' adopted strategies and the broader dynamics of change.

Workshops (3 no.) among the research teams and other invited international academics.

Publication of a joint report on the research project.

The Egan Report (1998) identified the problems that needed to be tackled, including the need to modernise, to address the dissatisfaction of private\_ and public-sector clients due to under-achievement, as well as fragmentation of the industry.

Learning from the experience of the manufacturing and service industries, the Egan Report (1998) identified five key drivers of change: (i) committed leadership; (ii) a focus on the customer; (iii) integrated processes and teams; (iv) a quality driven agenda; and (v) commitment to people. To drive dramatic performance improvement, the report proposed that the construction industry should set clear measurable objectives, and then adopt quantified targets, milestones and performance indicators.

Pointing out that there are significant inefficiencies in the construction process, the report aimed for a much more systematised and integrated project process to reduce waste and improve both quality and efficiency. The report noted that substantial changes in the culture and structure of the construction industry were required to enable improvements in the project processes. These include changes in working conditions, skills and training, approaches to design, use of technology, and relationships between companies.

The Task Force called for commitment from major clients, the construction industry, and the government to improve the efficiency and quality of construction. It encouraged the public sector, as the largest client group, to play a leading role in the development of a more sophisticated and demanding customer base for construction.

## **IMPROVEMENT PROGRAMME IN SINGAPORE**

The Construction 21 Committee Manpower was established in May 1998 by the Ministry of Manpower (MOM) to address the manpower problems in the construction industry in Singapore. It was subsequently merged with the Committee on Practices in the Construction Industry set up by the Ministry of National Development (MND) to form the Construction 21 Steering Committee.

The Construction 21 Committee and its four working groups comprised more than 80 people from the private, public, and people sectors. They represented the professional bodies, trade associations, regulatory bodies, public agencies, unions, tertiary institutions, and the public, represented by Members of Parliament.

The committee undertook study missions to Hong Kong, Japan, UK and US to learn the best practices in the industry. It also sought the views of Sir John Egan and Professor Daniel Jones, who were involved in the development of Egan Report (1998).

It was initially intended that the committee would investigate issues related to labour supply and productivity in the industry, but it conducted a thorough investigation and cover many aspects of the industry, from Processes (practices, techniques, and integrated approach to construction), and Players (professionalism and skills) to Products (exporting construction expertise). It developed a vision for the Singapore construction industry: “To be a World Class Builder in the Knowledge Age”, with the change in the public’s perception of the construction industry from a Dirty, Demanding, and Dangerous (3D) industry to a Professional, Productive, and Progressive (3P) industry. The committee made 39 recommendations under 6 strategic thrusts, which were: (i) enhancing the professionalism of the industry; (ii) raising the skills level; (iii) improving industry practices and techniques; (iv) an integrated approach to construction; (v) developing an external wing; and (vi) a collective championing effort for the construction industry.

## **IMPROVEMENT PROGRAMME IN HONG KONG**

The Construction Industry Review Committee (CIRC), with membership widely drawn from the construction and property sectors, trades unions, universities, clients, and government, was set up in April 2000 to investigate issues in the construction industry in Hong Kong and to make recommendations for improvement. The report of the CIRC, entitled “Construct for Excellence” (CIRC, 2001) grouped the issues under three headings: performance, process, and business. The vision for the construction industry was: “an integrated construction industry that is capable of continuous improvement towards excellence in a market-driven environment”.

The report made 109 recommendations, which were grouped under seven key aims: (i) fostering a quality culture; (ii) achieving value in construction procurement; (iii) nurturing a professional workforce; (iv) developing an efficient, innovative, and productive industry; (v) improving safety and environmental performance; (vi) devising a new institutional framework to drive the industry; and (vii) implementation of a change programme for industry.

One of the recommendations was to set up an “industry co-ordinating body” to lead a change programme. The Provisional Construction Industry Co-ordination Board (PCICB) was established in September 2001 with membership drawn in part from the members of the Review Committee.

## **IMPROVEMENT PROGRAMME IN MALAYSIA**

In Malaysia, following a decline in the performance of the construction industry, it was realised that there was an urgent need for the foundations of the industry to be strengthened to prepare it to face its future challenges. In 2003, the Construction Industry Development Board (CIDB) and the Building Industry Presidents Council (BIPC) identified the need to propose recommendations and action plans to attain this aim. The Construction Industry Master Plan (CIMP) was developed by the CIDB in collaboration with the BIPC and various organisations representing the industry.

The master plan, which covers the period of 2006-2015, outlined a strategic roadmap to develop the construction industry into a world-class, innovative, and knowledgeable global solution provider.

In order to achieve the vision, seven strategic thrusts were identified, and these formed the basis of the main recommendations. The thrusts were (i) integrate the construction industry value chain to enhance productivity and efficiency; (ii) strengthen the image of the construction industry; (iii) strive for the highest standard of quality, occupational safety and health, and environmental practices; (iv) develop human resource capabilities and capacities in the construction industry; (v) innovate through research and development (R&D) and adopt new construction methods; (vi) leverage on information and communication technology in the construction industry; and (vii) benefit from globalisation including the export of construction products and services.

A smaller committee comprising representatives of the Ministry of Works, Ministry of Entrepreneur and Cooperative Development, and Ministry of Finance would handle the implementation of the seven thrusts.

## **CHANGES IN THE FOUR COUNTRIES**

This section presents the changes that have been happening in the four countries ever since the publications of the improvement programmes in the respective countries.

### **CHANGE IN THE UNITED KINGDOM**

In the UK, the Strategic Forum was formed in 2001 to oversee the industry reform movement. It had revised the set of targets to be achieved by the end of 2007 (Strategic Forum for Construction, 2002). Recently, the time frame has been extended to 2012, relating to the construction works for the 2012 Olympic Games.

After the publication of the Egan Report, at least eleven more reports have been published. The reports were target-driven, focusing on performance measurement for efficiency. The latest report, *Never Waste a Good Crisis*, published in October 2009, reviewed the progress which had been made since the publication of the Egan Report. The report (Constructing Excellence, 2009) portrayed a dim situation. It noted that whereas there had been some progress, this was nowhere near enough to what had been expected. It also observed that the commitment to the principles in the Egan Report was only skin-deep. Few of the targets set in the Egan Report had been met in full, whereas most of them had fallen considerably short.

The Egan Report (1998) had set seven targets for 10 to 20% year-on-year improvement in capital cost, construction time, predictability, defects, accidents, productivity, turnover and profits. Constructing Excellence (2009) reported that, in general, the Egan targets had not been met in the industry. Improvement in profitability was largely due to favourable economic conditions in the last decade. While there were significant improvements in safety and productivity prforshowed reasonable progress, there was still a need for major improvement in the area of predictability. A programme of demonstration projects had been successful; more than 500 projects worth £14 billion had contributed to the industry's knowledge base of innovation and best practice (Constructing Excellence, 2009).

The report (Constructing Excellence, 2009) identified four key blockers to progress. Firstly, the growing economy in the years following the publication of the recommendations provided no impetus for a radical transformation of the construction industry. Secondly, there was a lack of capable people within the industry, particularly at the senior management level with the leadership skills required to bring about a radical cultural change. Thirdly, a lack of integration in the delivery process impeded continuous improvement. Fourthly, the diverse and fragmented structure of the industry made it difficult to serve the interests of the industry as a whole.

Furthermore, Green *et al.* (2008) argue that industry improvement reviews tend to insist that firms should adopt 'best practice' recipes such as lean thinking, partnering, and integrated teams. While the reports following the Egan Report (1998) focus on integration, the challenge is that the industry is heavily fragmented. There is hardly any effort to think of how to adapt the organisational routines to changing circumstances.

## **CHANGE IN SINGAPORE**

The BCA closely co-ordinated and monitored the following-up of the recommendations. Even the recommendations that had not been approved (i.e. export promotion and research) were followed up. As one interviewee noted, "*The report card on C21 would be a decent one because everything that can be done has been done. In many cases, they went beyond what was proposed.*"

In terms of the transformation from a 3D to a 3P industry, the interviewees agreed that the industry has progressed, but the degree of progression was not as much as it should have been. On strategic thrust 1, the Construction Real Estate Network (CORENET) project, a major IT initiative to provide an integrated infrastructure for the construction industry stakeholders to communicate with each other and exchange information, was as the most significant achievement of C21. The professionalism of the industry has been improved, but there is still room for improvement. New awards have been created, incorporating key points from previous ones. Many new degree programmes have been started to meet the needs of the industry, but a number of the interviewees expressed their concerns about the quality of the curriculum and graduates. There has been improvement in the implementation of the Continuing Professional Development (CPD) programme; it has now become mandatory for some professions, notably, architecture and engineering. A common code of conduct for the construction industry, which was one of the C21 recommendations, was drafted but it has not been implemented because, according to one interviewee, it was considered to be so general that it was not necessary. In the C21 report, the multi-layered subcontracting system was mentioned as one of the causes of poor productivity in the industry. Many of the small firms are poorly managed, lack the incentive and ability to

invest in training and in new technology, and are unable to reap economies of scale in their operations, resulting in much wastage (Construction 21 Steering Committee, 1999). One of the recommendations in C21 was to license all contractors including sub-contractors in order to enhance their standards and professionalism. As the licensing was only implemented in December 2008, the impact has yet to be realised.

On strategic thrust 2, the issue of foreign workers was the main concern for many interviewees. They highlighted the cultural differences, transient nature of the workers, the hidden costs, low level of skills, impact on safety performance, and the support provided by the government to the workers. The Man-Year Entitlements (MYE), which determines the number of foreign workers which a company can employ for each project as determined by the cost and duration of the works, had been tightened and then the cuts had been somewhat restored in response to feedback from the industry. Unexpected practices have developed, which gave an impression that the MYE was still at a comfortable level for the contractors and hence, ineffective. There has been improvement on the construction workers' skills, with the introduction by the BCA of the Skill Evaluation Certificate (SEC) and Skill Evaluation Certificate (Knowledge) – SEC (K).

On strategic thrust 3, the interviewees noted that, owing to the legislation on buildability, productivity has improved, but there was still room for improvement. BCA's policy on productivity performance has progressed from considering buildability as the main determinant towards constructability. The Construction Quality Assessment Scheme (CONQUAS) (an objective method for assessing the quality of a construction project which was introduced in 1989) has improved quality to a certain degree, and it has been extended to the Quality Mark for residential buildings which seeks to give owners and end purchasers of units an indication of the quality. The National Productivity and Quality Specifications (NPQS) has been launched, but it has not been pervasively used in the industry. The NPQS is currently being revamped in an exercise involving a number of professional institutions.

C21 also targeted improvement in construction safety. The Joint MND-MOM Review Committee (JRC) on Construction Safety was convened after two serious accidents in 2004, in order to review the regulatory framework and ancillary systems to raise safety standards in the construction industry (JRC, 2005). The committee identified gaps in the regulatory framework and ancillary systems. It has made recommendations to help strengthen the legislative provisions pertaining to temporary structures, raise professionalism and competency of professionals, contractors, and supervisors, and make transparent the public sector procurement system to take safety into account. The Construction (Design and Management) or CDM Regulations will require designers to work closely with contractors in thinking through safety management for the entire life-cycle of a project (Gan, 2008). "Implementing WSH2015 for Construction Industry" was launched in 2007 to guide the efforts of the construction sector. Since then, considerable improvements have been made, including the development of the Construction Safety Audit Scoring System (ConSASS), the review and enhancement of the Construction Safety Orientation Course (CSOC), the publication of the construction accident case study booklet, the release on Guidelines on Design for Safety (DFS) in Buildings and Structures as well as the inaugural Construction Chief Executive Officer (CEO) Summit, where CEOs from top construction companies signed to pledge management commitment for zero injuries. The guide has since been updated to include areas for enhancement and new areas of work to achieve sectoral targets by 2018. "Implementing WSH 2018 for Construction

Sector in Singapore” (WSH Council, 2010) was published in April 2010. It sets the targeted outcomes, key strategies and initiatives to further enhance WSH standards in the construction sector and aims to guide all stakeholders to create a safer and healthier construction sector with a progressive and pervasive WSH culture.

Research remains limited and segregated within the construction industry in Singapore. However, research within the industry has been encouraged by the recent MND Research Fund for the Built Environment, which is administered by the BCA. In terms of safety, there has been much progress in the regulations and in the systems introduced by companies. However, these have not had the desired appreciable impact on performance. A web-based application for the Construction Management System was completed in 2004, but it did not take off in the industry. Finally, on the initiatives under thrust 3, the advice that modifications to the standard contracts for the private sector should be minimised has not been realised. On the contrary, indeed, many of the professional institutions have introduced additional new standard contract forms.

On strategic thrust 4, Design and Build (D&B) was one of the procurement methods encouraged by C21 owing to its perceived potential to foster integration in the construction process. However, some of the interviewees emphasized that, as a procurement method, D&B may not be appropriate for certain projects. D&B is now mainly used in civil engineering projects. For building projects, it is more of Design, Development and Build. The formation of multi-disciplinary firms, as encouraged by C21, did not take off in the industry.

On strategic thrust 5, BCA has launched a number of programmes to promote exports of construction services, such as the Export Digest, Export Link Services, workshops, seminars, mission trips, and executive programmes. Singapore-based architects have done quite well abroad. Contractors have been aware of the need to go overseas, especially when there are fewer jobs in Singapore. A number of consortia have been set up to pursue projects overseas, and they have won and undertaken some works.

In terms of strategic thrust 6 on a collective championing effort, BCA actively monitored and followed up on the list of C21 recommendations. CIJC was formed in 2000 to formalise the co-operation among the key organizations in the construction industry embracing clients, various design professionals, and contractors. It comprises the Presidents of nine professional institutions and trade associations in Singapore’s construction industry. Within CIJC, each institution was assigned relevant C21 initiatives to monitor progress in their implementation. BCA held quarterly meetings with CIJC to track the progress of implementation; in addition, there were many *ad hoc* meetings. Feedback sessions with the industry were also conducted. However, as found in the interviews, it is widely realised that the main limitation of CIJC is that there is no real leadership; the presidency rotates every year among the member organisations.

In summary, the adoption of a range of progressive practices in Singapore has been encouraged by C21. CORENET has been most successful. CONQUAS, buildability, and CPD programmes have also been promoted by C21. However, there were some recommendations that have not been implemented, such as codes of conduct and Construction (Design and Management) Regulations, which are working in progress. Some of the C21 initiatives and programmes have not succeeded. These include the intention to reduce the number of foreign workers in the industry, specifically the MYE scheme, maintainability study, NPQS, Construction Management System, standardization of contracts, and formation of multi-disciplinary firms.

The construction industry in Singapore continues to face new challenges. Among others, companies have to deal with rising costs of land and construction materials, and shortage of construction workers and rising wages. Owing to the impact of the major initiatives such as awards for performance, buildability, and CONQUAS, point-scoring system has become the main focus above all. After a decade of implementation of improvement initiatives, some underlying issues remain. Some characteristics of the industry, such as low productivity, labour intensity of work, and low-technology construction methods, remain. While commending the government for its efforts in regulating the construction market and industry, there is a sense among the industry stakeholders interviewed that there might be too many regulations. Hence, it is important to strike a balance, as too many regulations may dampen creativity. Given the limited supply of Singaporean construction workers, foreign workers are in Singapore to stay. Hence, the issue of foreign construction workers will have to be continually addressed. Finally, there is a need to strengthen the role of professional institutions and trade associations, tertiary educational institutions, and the CIJC.

## **CHANGE IN HONG KONG**

Prior to the formation of the statutory co-ordinating body as recommended by CIRC (CIRC, 2001), the implementation of the CIRC recommendations was undertaken by an interim body, the PCICB. The process of implementing the recommendations had been held up by the unexpected delays in the formulation and promulgation of the legislation. The bill to set up the Construction Industry Council (CIC) was introduced in the Legislative Council only in 2004, while the tasks of implementation were handed over to the CIC only in 2007.

Interim reports (PCICB, 2005; ETWB, 2007) have reviewed the progress made in the implementation of the CIRC initiatives. The general perception was that there had been good progress in the implementation programmes. Nevertheless, Kumaraswamy *et al.* (2010) noted that there were areas for improvement, as found out from interviews with industry stakeholders.

Although the setting up of CIC is in the right direction towards the establishment of an institutional framework as envisaged by “Construct for Excellence” (CIRC, 2001), many believed that CIC lacks regulatory power, hence the progress in formulating and disseminating industry development initiatives was slow (Kumaraswamy *et al.*, 2010). Safety levels in construction, especially on public-sector projects, have been significantly improved. Quality levels have also been improved mainly due to the introduction of registration schemes for workers and subcontractors. Alternative procurement methods such as D&B and target cost contracts have not been as widely used as envisaged in the CIRC recommendations. There had been improvements in the development of an environmentally responsible industry, especially with the formation of the Hong Kong Green Building Council. In terms of nurturing a professional workforce, the regeneration of the workforce was identified as the key problem, as the image of the industry had made it difficult to attract new people to join the industry (Kumaraswamy *et al.*, 2010).

In summary, although the overall progress in the implementation of the CIRC recommendations in Hong Kong is satisfactory, there is room for improvement in certain areas such as improving the image of the industry, attracting new entrants to join the workforce, as well as implementing programmes in the private sector.

## **CHANGE IN MALAYSIA**

In Malaysia, despite the decline in the volume of construction projects due to the recent global financial crisis, the construction industry remains strong and important to the national economy. However, growing dependence on foreign workers create a number of social issues such as proper treatment, discrimination, and violation.

In the future, the focus will be on the implementation of IT, green initiatives, and prefabrication. The government will continue to provide leadership in the implementation of the CIMP recommendations. It will also have to provide incentives and implement stimulus packages. The Green Building Index was launched in 2009 to assess environmental impacts of buildings and create guidelines for new building construction. The Industrialised Building System (IBS) programme will continue to be streamlined to promote prefabrication, improve productivity, and reduce the reliance on foreign workers.

As it is now five years since the CIMP was launched, a comprehensive review of the impact and effectiveness of the implementation of the initiatives under the master plan should be conducted.

## **SIMILARITIES AND DIFFERENCES AMONG THE FOUR COUNTRIES**

Similarities and differences in the construction industry development programmes in the four countries studied can be drawn. The institutional contexts within which the reforms occurred were distinctive in each country. However, in all four countries, there were specific targets to achieve within a certain period based on specific recommendations. There was a radical tone of performance improvement in all four reports.

There are similarities in the original strategic thrusts of the four countries, as shown in Table 1. All countries studied highlighted improvements in quality and the issue of integration. While the Egan Report is more general, on this point, the last three reports (Singapore, Hong Kong, and Malaysia) are very specific and very similar in terms of structure, strategic thrusts, and recommendations, and implementation plans. Environmental performance, which was included in “Construct for Excellence” of Hong Kong and the CIMP of Malaysia, was not considered in the Egan Report of the UK and C21 of Singapore. However, the UK and Singapore have since focused on the issues. In the UK, Environmental Performance Indicators (EPis) were launched in 2001 and sustainability has since been singled out as one of the key improvement areas (Strategic Forum, 2002, 2008). In Singapore, improving the environmental performance of the construction industry has been a major focus of the BCA over the past few years. The environmental development programme includes: making certification to environmental management system a requirement for medium-sized to large construction and consultancy firms; formulating benchmarks for assessing the environmental performance of both new and existing buildings, and infrastructure items (the Green Mark Scheme was launched in 2005); and providing funds to support R&D on the subject. The BCA has formulated two master plans for environmental performance, and the Singapore Green Building Council was set up in 2009. The regulations require buildings to meet a minimum Green Mark score before being granted building plan approval. The green building initiatives have been quite successful; they have been strongly supported in the industry, by clients, practitioners and users.

In all four countries, it was realised that many problems were deeply rooted in the construction industry; hence there was a need for a radical transformation that required a strong commitment from all stakeholders of the industry. The poor image of the industry was one of the concerns; it was considered to be making it difficult to attract new entrants to join the industry. This issue is particularly pressing in Singapore and Hong Kong which have relatively small population sizes. Other issues include low productivity, labour intensity of the work processes, as well as the diverse and fragmented structure of the industry. An “industry co-ordinating body” was proposed to lead the change programme in each country. In the UK and Hong Kong, the co-ordinating bodies were formed specifically for the reform programme. Over the years, during the implementation of the change programmes, it was apparent that the major institutions involved in it should be strengthened. In Singapore, many of the initiatives have been implemented with the support of legislation. While this has been effective, and many of the interviewees commended the government for its efforts, there was a feeling that the industry was over regulated. On the other hand, in Hong Kong, it is felt that the CIC lacks regulatory powers.

## **INFORMATION TECHNOLOGY**

In the future, Building Information Model (BIM) will be used as a platform to facilitate the integration of knowledge in design and construction, and handing over to facilities management. BCA, together with the Industry Foundation Classes (IFC) Implementers Work Group (IIWG) of International Alliance for Interoperability (IAI), have been promoting the use of BIM.

As BCA is promoting green buildings, BIM facilitates the design of such buildings. For instance, designers are able to perform energy data analysis and to determine how “green” their virtual building models are. From there, they can explore ways to improve the building’s energy consumption. BIM can also simulate the amount of daylight during different times of the day, month and year. This allows architects, engineers and builders to experiment with different sun-shading features that can be integrated into a building’s design.

To encourage the adoption of this technology, BCA introduced a pilot project for the electronic submission of building plans. More than 10 architecture sites were involved in this pilot, and their live projects were submitted to various regulatory agencies, including BCA. The feedback from both the industry and various agencies was positive. With the success of the pilot project, the various agencies are now ready to receive and process architectural submissions created using BIM from the industry starting January 2010 (BCA, 2009).

## **CONCLUDING REMARKS**

### **The four countries reviewed**

In all the four countries reviewed, there is a general agreement that the involvement of the various stakeholders of the construction industries is of paramount importance in order to make reform happen. The general view is that progress has been made, but much more remains to be done; the degree of progression has not been as much as had been expected. Some of the underlying issues remain.

One decade after the publication of the reports, there were some questions among respondents in the study on whether the programmes are still relevant to answer today’s challenges. However, construction industries of the four countries reviewed

have been keeping in touch with ongoing developments; for example, in Singapore, there has been a focus on through continuous improvement in IT applications, and in the area of sustainability which was neither mentioned nor envisaged in the C21 report. The results obtained from the study so far also show that it is important to better understand the different institutional contexts shaping the changes in the construction industry in each country. At the same time, lessons learned from other countries will be useful for formulating strategies and recommendations for actions in other nations, so long as the specific initiatives are shaped with due recognition of the local contextual dynamics.

Table 1 Visions and strategic thrusts for the construction industries in the UK, Singapore, Hong Kong, and Malaysia (in chronological order)

<b>United Kingdom</b> Egan Report (1998)	<b>Singapore</b> Construction 21 (1999)	<b>Hong Kong</b> (Construct for Excellence (2001)	<b>Malaysia</b> Construction Industry Master Plan Malaysia 2006-2015 (2007)
VISION: “A modern construction industry (the need for a new way of working, such as lean production, standardisation, partnering).”	VISION: “To be a world class builder in the knowledge age.”	VISION: “An integrated construction industry that is capable of continuous improvement towards excellence in a market-driven environment.”	VISION: “A world-class, innovative, and knowledgeable global solution provider.”
KEY DRIVERS OF CHANGE: Committed leadership.  A focus on the customer.  A commitment to people.	STRATEGIC THRUSTS:  Enhancing professionalism of industry.  Raising the skills level.	STRATEGIC THRUSTS:  Nurturing professional workforce.	STRATEGIC THRUSTS:  Develop human resource capabilities and capacities in the construction industry.  Strengthen the construction industry image.  Leverage on information and communication technology in the construction industry.
A quality driven agenda.	Improving industry practices and techniques.	Fostering a quality culture.  Improving safety and environmental performance.	Strive for the highest standard of quality, occupational safety and health and environmental practices.
Integrated processes and teams.	Adopting an integrated approach to construction.	Achieving value in construction procurement.	Integrate the construction industry value chain to enhance productivity and efficiency.
		Developing an efficient, innovative, productive industry.	Innovate through research and development and adopt new construction methods.
	Developing an external wing.		Benefit from globalisation including the export of construction products and services.
	Collective championing effort for construction industry.	Devising a new institutional framework to drive the industry. Implementation of a change programme for industry.	

### **Other construction industry development programmes**

Construction industry development programmes are being implemented in countries at all levels of development. These include the Netherlands, Sweden and the United States, as well as South Africa and Rwanda. Much has been achieved in most cases, but more remains to be done. The study discussed in this paper underscores the importance of country specificity. It shows that understanding of the economic, social and administrative context is key to progress in these efforts. Thus, care should be taken in seeking to replicate what has worked in one country in one's own nation. Another issue is the need for appropriate institutional frameworks, and for the involvement of all key stakeholders in the programme formulation and implementation efforts. Finally, whereas this is beyond the scope of this study, there is potential benefit in regional inter-national collaboration in tackling common issues.

### **International collaboration**

The study also shows that researchers, both as individual and groups have much to contribute in the effort to formulate effective construction industry development programmes. For example, such research can explore the likely institutional and contextual constraints and problems, and propose possible solutions. Thus, researchers constitute an important resource, especially in the developing countries. There is even greater value in international collaboration on industry development. WABER provides an excellent forum to facilitate the identification of research subjects of common interest, the formulation of common research frameworks and methods, and in the comparison of findings and potentially useful programmes.

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# **BUILT ENVIRONMENT RESEARCH IN WEST AFRICA: CURRENT TRENDS AND FUTURE DIRECTIONS**

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The countries in West Africa (WA) are pushing for socio-economic development. It is evident that the construction sector has an important part to play in helping to realise this goal. It is equally evident that this necessitates an increased emphasis on research in the built environment in order to develop the necessary capacity, capabilities, knowledge and technologies for the sector. Such research work is not trivial and is liable to be highly context driven. It is therefore of interest to look into what kind of problems WA researchers are working on and the means and methods that they draw upon. Or put slightly differently, does the research that is undertaken match the socio-economic aspirations of countries in the region and is it aligned with international research endeavours and our current common knowledge? It is also of interest to look at how the research is carried out. Are the research methods used appropriate and adequate for the research problem at hand?

The West Africa Built Environment Research (WABER) conference was initiated in 2008. The objective is to provide a vehicle for the development of built environment research in WA through giving young researchers and early-career scholars an outlet for their research work; and to supply a platform for networking and collaboration among more senior academics. Two conferences have so far been organised, in 2009 and 2010, bringing together 180 academics, researchers and practitioners from the WA region. These delegates represent more than 30 universities/polytechnics, as well as a multitude of other research institutions.

This presentation draws on content analysis of the papers in the proceedings of these two conferences: 2008 (25) and 2009 (55), as well as those published in this current 2011 conference. These 170+ research papers provide a window into current research priorities and trends and, thus, offer an opportunity to understand the kinds of research work undertaken by built environment researchers in West Africa. They also provide an opportunity to further look into the how research is commonly undertaken.

Several conclusions are drawn from this content analysis exercise, including: 1) the two most common problem areas are 'Physical infrastructure and environment' and 'Economics and construction industry development'. More than half of the published papers deal with issues within these two domains. 2) In more than 2/3s of the papers the problem formulation is given at a national level. Very few papers take a local, regional or international perspective. 3) There is a stark overrepresentation of survey studies relying on questionnaires for data collection. There are four times as many papers using surveys as there are of any other research method. 4) In a significant number of cases the chosen research method is not suitable for the problem under investigation.

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The findings lay bare some of the many challenges that are faced by academics in WA. It is clear that WA research by necessity is extremely problem driven. An apparent downside of the heavy focus on current practice is that the research in many cases takes the form of consultancy work. As such, the outputs are at times both valid and important however the impact is local and predominantly short term. There is, therefore, a need to look into how research problems can be formulated and appropriate research methods be used, so that knowledge can be created and distributed, thus providing a foundation for a more long term impact. The presentation ends with a couple of suggestions for alternative directions for future research and development work.

# **DATA COLLECTION AND ANALYSIS: WHAT IS DATA, HOW DO YOU COLLECT IT, AND HOW DO YOU ANALYSE IT?**

**Dr Chris Harty<sup>1</sup>**

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Good data collection and analysis form the keystones of good research, whether for a PhD or 10 year research project! This practical session will begin with a brief overview of approaches to data collection and analysis, with an emphasis on practical issues of data collection strategies, access and ethics, managing data sets and producing analyses which are consistent with the methodologies and theoretical frameworks employed.

The main part of the session will be a Q&A, where we will look at participants particular issues around data collection and analysis strategies and processes. What sort of data should we collect for a particular research problem or focus? How do we go about negotiating access or managing ethical and IP issues? How might we structure data sets or how should we represent data within thesis or papers? Any issues you might have be encountering as you do your research, please bring them along!

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Harty, C. (2011) Data collection and analysis: what is data, how do you collect it, and how do you analyse it? *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 27-28 July 2010, Accra, Ghana, 19.*



## **SECTION 2: CONFERENCE PAPERS**



# A COMPARATIVE ANALYSIS OF CLIENTS' AND CONSULTANTS' PERSPECTIVE OF CONSTRUCTION PROJECT PERFORMANCE

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The true state of construction projects at any stage in its life cycle has often been a source of disagreement between clients and their consultants leading to several disputes. This is due to the fact that consultants have always defined the performance of a project using their own perspective models which do not always meet clients' expectations. In recent times, construction project clients have become more involved in their projects, ensuring best practice and even, sustainability. Clients, thus, have their own perspective of project performance which needs to be considered in any assessment model in order to meet their satisfaction. Using interviews and multiple surveys, the study identified the key measures that defined the project performance in the perspectives of clients and consultants in Ghana. These were found to be fundamentally different, both in content and in focus. It then combined the two perspectives into a "shared perspective" and tested it on the individual stakeholders. The research also showed that given the same criteria, clients and consultants placed relatively similar emphasis on the same criterion; predicting a common direction with marginal dissimilarity. This pointed to the conclusion that the real differences that exist between clients and consultants is basically due to the different perspectives used by the two stakeholders in assessing project performance. Hence the study recommends that for effective assessment of construction project, a framework of the "shared perspective" representing both perspectives should be used.

Key words: client, consultant, Ghana, performance.

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Gyadu-Asiedu, W. (2011) A comparative analysis of clients' and consultants' perspective of construction project performance *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 23-36.*

# **A COMPARATIVE STUDY OF HOUSING TRANSFORMATION PROCESSES IN THREE GOVERNMENT ESTATES IN SOUTH WESTERN, NIGERIA**

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This Comparative study on Housing transformation examines the transformation processes in three government estates. It seeks to highlight the differences in the processes. The study investigates the oldest estates in three out of six states that made up of South-Western, Nigeria as case study. Data for the study were collected through observation, interview schedules and structured questionnaires administered on 474 transformers. Variables investigated include: Cost, Duration and Mode of transformation; Reaction to transformation activities in the neighbourhood; Effect on Environment and mode of construction . Results from the survey were analysed using descriptive statistics in form of frequency tables, percentages and charts, chi-square test and correlation analysis. Findings indicated that people embarked on Housing transformation to provide those infrastructures that were not provided by Government. The studies identify delay of approval of plan and lack of cash flow as problems encountered in the transformation process. The need to provide transformers with credit facilities, accommodate extension as phase construction, seek proper approval for proposals are some of the recommendations emphasized in the study.

Keywords: government estate, housing transformation, income level, infrastructure, Nigeria, phase construction.

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# A COMPARISON OF SELECTED NATIONAL ACOUSTICS BUILDING CODES: CASE STUDY OF CATHEDRAL ROAD, AKURE

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There are three problems that this present generation has to cater for: Poverty, Population and Pollution. Industrialisation and urbanisation has taken the problems of noise pollution to an unprecedented catastrophic level both in the developed and the developing nations of the modern world. While the advance countries have taken some legislative measures in form of Acoustics Building Codes to control the problem of noise and its attendant effects, the developing nations like Nigeria may not have faired well in this regards. This paper, therefore, is an attempt to compare the building codes in some selected countries of the world with emphasis on the acoustics regulations of the building codes. The countries whose Acoustic Building Codes are to be examined include: England (United Kingdom), United State of America, New Zealand, Australia and Nigeria. The Acoustic Building Codes of these nations will be compared with that of Nigeria in terms of regulatory provisions. A practical case study of Cathedral – Ondo road, Akure will be made to evaluate the level of compliance with the provisions of the National Building Code, if any.

Keywords: acoustics, building code, noise, pollution, urbanisation.

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# A REVIEW OF THE CURRENT HEALTH AND SAFETY LEGISLATION IN BOTSWANA RELATIVE TO CONSTRUCTION INDUSTRY STAKEHOLDERS

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Most of the health and safety (H&S) regulations and legislation commonly found in Southern African developing countries are based on legislation enacted in the industrialized countries in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. This is evident in many factories acts promulgated for developing nations dating back to colonial times or soon after independence was granted. Botswana, formerly a British Protectorate, has two H&S legal frameworks meant for construction industry, viz. the Botswana Factories Act and the Workman's Compensation Act. In 1972 Lord Robens, the Chairman of a Royal Safety Commission Report, recommended self-regulation as this would engender continuous improvement and improve standards in legislation within a goal-setting legal framework supported by codes of practice and / or performance standards. These standards could be revised more easily than primary legislation which may require difficult enactment passage in parliament. This has not happened in the case of the Botswana Factories Act. International scholars affirm that the presence of legislation addressing H&S indicates a level of commitment and provides the framework within which H&S can occur. Many scholars agree that construction industry is unique and requires specific tailor made H&S laws and regulations as a starting point of preventive measures. The purpose of this paper is to review existing legislation to highlight the extent of coverage and relevance to the construction industry in Botswana. The review established that the current factories act is still largely meant to cover the industrial / manufacturing industries. It further established that there is no statutory obligation clearly stipulated to deal with H&S at the conceptual stage of any construction project within the construction industry. This suggests that there is urgent need for the state to arrange a forum with the construction industry practitioners to formulate regulations that will be specific and current for the construction industry.

Keywords: Botswana Factories Act, Health and safety, Workmen's Compensation Act.

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Mwanaumo, E. and Thwala, W.D. (2011) A review of the current health and safety legislation in Botswana relative to construction industry stakeholders *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 47-57.*

# **A STUDY OF THE SOURCES OF NOISE POLLUTION AND THEIR IMPACTS ON THE BUILT ENVIRONMENT: A CASE STUDY OF OBA-ILE HOUSING ESTATE, AKURE, NIGERIA**

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Among the problems associated with technological advancement made by man in modern times which is not receiving enough attention from those responsible for the planning and designing of the built environment is noise pollution. Noise, an unwanted and irritating sound, is a form of environmental pollution and a source of stress. Loud noise is harmful and impacts negatively on the quality of the built environment. This paper, therefore, seeks to identify the major sources of noise and its impact in the built environment of a typical housing estate in Akure, the capital of Ondo State. The paper adopted a survey research method. It relied on the data collected from a survey carried out on some of the buildings along the major streets in Oba-Ile Housing Estate, Akure, Nigeria. It was observed that noises from vehicular traffic, pedestrian traffic and religious buildings, as the major sources of external noise, have very serious negative effects on the residents. Generating sets, telephone/mobile phones, radio and television sets constitute the major sources of internal noise with very serious negative effects on the residents of the study area. It recommends good design and building orientation, adequate set back, reduction in the opening sizes and reduction of noise from sources as some of the ways to minimise the problems of noise pollution in built environment.

Keywords: environmental pollution, noise, Oba-Ile housing estate, Nigeria.

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# AFFORDABILITY ASSESSMENT OF THE HOUSING UNITS BUILT FROM FEDERAL MORTGAGE BANK'S LOANS IN NIGERIA

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Low affordability has been a central concern in Nigeria's housing problem. This is traceable to either insufficient income, excessive cost of Housing, or both. Affordable housing units are ones built within financial abilities of buyers or whose rent or mortgage does not exceed 30 % of gross annual household income (Andrew in Musa-Haddery 2011). Currently, majority of Nigerians cannot afford to own houses even after solutions were attempted by the Federal Mortgage Bank of Nigeria (FMBN) through the grant of loans to developers to construct various classes of housing units and another set of loans through Primary Mortgage Institutions (PMIs) to individuals that contributed to Nigeria's National Housing Fund to buy the housing units produced. The only hypothesis of the study assumed no significant relationship between gross average annual incomes of the low, middle, and high income groups in Nigeria and the costs at which the various classes of housing units were sold. Data was collected via questionnaires administered on FMBN and mortgagors through stratified purposive sampling. Analyses were by ratio tests and Spearman's ranked correlation. Findings revealed acceptance of null hypothesis for relationship between the gross annual income of the lowest paid income group and the costs at which low income housing units were sold. The null hypothesis was rejected each for relationship between the gross average annual incomes of the middle and high income groups and the costs at which the respective incomes housing units were sold. The patronage of local improved materials and improved naira value were advocated.

Keywords: affordability, gross annual income, mortgage loan, naira value.

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Madawaki, M.N. (2011) Affordability assessment of the housing units built from federal mortgage bank's loans in Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 69-78.*

# AFFORDABLE HOUSING INITIATIVE IN NIGERIA: USE OF COMPOSITE PANELS

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One main challenge facing housing in Nigeria is the rising cost of building construction, which is a factor of the over reliance on the importation of building materials. This study investigates the use of cement-fibres composite panels, a local building material made of cement reinforced with coconut shaft, a by-product of coconut palm, for cost-efficient and low-cost building panels. Data were collected through experimental and survey methods. The empirical survey, conducted among selected leading professionals in the building industry namely architects, engineers, quantity surveyors and builders includes the use of questionnaire, interview methods and observations. Besides, interview schedules administered to building professionals were used to collect information on sampled projects that exhibited the use of the material to elicit opinions on them. The water absorption, thickness, swelling and linear expansion and aesthetical satisfaction of the material were tested. Results from analysis of the field survey on eleven (11) buildings shows that cement-bonded composite panels are comparatively cheaper, sound-proof, durable, lighter-weight and environmentally friendly than the conventional sandcrete blocks and should be a replacement to conventional masonry in housing delivery.

Keywords: affordable, building panels, composite, housing, Nigeria.

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# ANALYSIS OF THE SOCIO-ECONOMIC CHARACTERISTICS AND HOUSING CONDITION IN THE CORE NEIGHBOURHOOD OF AKURE, NIGERIA

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The paper highlighted survey on low – income settlements in the core area of Akure, the capital of Ondo State, Nigeria and examined the socio – economic characteristics of the respondent and the physical state of the building they occupy. It gathers field data among residents of low income neighbourhoods of Akure using random sampling technique. The data were analysed using simple frequency and percentage distribution tables. The study revealed that most of the residents are engaged in the informal sector of the economy (self employed), their income level is very low and that household size is very high .The survey carried out on housing revealed that most dwellings were constructed before 1960 and are of monolithic type. They are lacking in essential infrastructures and a large number are unsatisfactory by modern standards. Since the failure of slum clearance scheme suggest that wholesale clearance of substandard housing area particularly those built up during the pre colonial period are not practicable in Nigeria urban areas, and while we are aware of the fact that findings of a study of this type may be more typical of the case than more general to other cities, there is every reason to believe that the issues involved are more national than local. The policy recommendations have therefore been geared to reflect this observation.

Keywords: Akure, city, core neighbourhood, housing, urbanisation.

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# **AN APPRAISAL OF HOUSING CONDITIONS IN RESIDENTIAL CORE AREA OF AKURE CITY IN SOUTH WESTERN NIGERIA: A CASE STUDY OF EREKESAN**

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This paper appraises the condition of housing in residential core area of Akure city in SouthWestern Nigeria taking Erekesan, which consists of Erekesan-Itanla, Eruoba, Afunbiowo, Alakure, Alakure-Ijofi and Iworokosagba as case study. Assessing the quality of existing housing stock, quality of the housing environment, and the availability of the neighbourhood facilities were the major objectives. Data were obtained through questionnaire, personal interview, physical observation of the housing structures and were analysed with appropriate statistical tools. The study reveals a homeownership rate of 40% with average occupancy ratio of 8 persons per household. Only 35.38% of the housing units surveyed have functional wc, 41.31% are with pit-latrine and 23.25% with no toilet facilities. 65.7% of the household depends on well for their domestic water supply while as low as 8.3% use in house taps. 42% of houses were constructed of compressed earth bricks, 23% used mud bricks while 17.5% used cement block. 16.5% of these dwellings were in good condition as against 83.5% with notable defects. About 22.5% households practice planned maintenance but only 16.8% have maintenance budgets, hence most houses do not show evidence of proper maintenance. Only 29.70% of the houses surveyed have access to good urban infrastructures such as road network and drainage system. The paper suggests massive construction of boreholes and pipe borne water, improvement on waste management scheme, engagement of more environmental inspectors, slum upgrading and improvement and direct government investments in urban infrastructure.

Keywords: housing stock, housing quality, housing environment, urban infrastructure, planned maintenance.

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# **AN EVALUATION OF THE TREND OF BUDGETARY ALLOCATIONS FOR INFRASTRUCTURAL DEVELOPMENT IN OSUN STATE, SOUTH-WESTERN, NIGERIA**

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Infrastructure development depends substantially on budgetary financing in Nigeria. The budgetary allocations have, however, been criticized to be based on non-procedural approach. While this has necessitated a scientific methodology, research effort in this area is limited. The study assessed the trend of budget allocations for infrastructure projects with the view to examining how the trends have impacted the level of execution of public infrastructure projects. Data for the study were based on archival data of budgetary allocations of five infrastructural projects from ten editions of Osun State budget between 1999–2008 and structured questionnaire directed to construction professionals and financial administrators in the public service of the State. These are architects, quantity surveyors, builders, town planners, estate surveyors, engineers (civil, mechanical and electrical), accountants and economists. The infrastructure projects are education, transportation, rural/urban electrification, health, housing and water projects. Data analysis was done through, mean, percentage and time series analysis. Trend functions obtained for each projects were modified by coefficient generated by setting the implementation level of the projects at 100% to generate appropriate models for budget allocation for the projects. These models would serve as tool for predicting the budget allocation for infrastructure development by policy makers in the state. Moreover, findings from the study indicated poor level implementation of public financed infrastructure suggesting the budgeting methodology and consistence level of the trend of budgetary allocations as significant to implementation level of public financed infrastructure in Nigeria.

Key words: infrastructure, budgetary allocation, project execution.

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# **AN INTEGRATED RELATIONSHIP AND SUPPLY CHAIN MANAGEMENT FRAMEWORK FOR IMPROVING ENGINEERING AND DESIGN SERVICE DELIVERY TO BUILDING CONTRACTORS IN GHANA**

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The culture of construction industry is well noted as being very competitive, fragmented, having little cooperation and being full of mistrust. Besides, in the review of relevant literature, the traditional supply chain relationships are criticized as adversarial and thus lack effective communication. Many research interventions both local - Ghanaian contract relationship development efforts such as public procurement act, suggested mergers and foreign efforts like relationship management (RM) and supply chain relationship (SCR) approaches are being increasingly developed. The construction industry maturity level to cope with such interventions is identified to be of four levels of relationships which can help the integrated relationship guidelines; for the transformation of the existing non collaborative and adversarial situation and for the improvement of EDSD work which seems to be worse in Ghana. The justifications offered for the Ghanaian situation that seems to have worse of such culture are inadequate, poorly articulated designs, delay in payment, strong adherence to the traditional system of procurement, inconsistent, uncoordinated control of projects, failure to capture clients requirements in tender document and lots of variations in the construction phases. There is little of such integrated research approach of exploring change of the culture and collaborative relationship levels concepts together to transform the construction industry. This PhD research is to find an integrated relationship management - supply chain relationship approach to improve engineering and design service delivery (EDSD) to contractors in Ghana. Management and supply chain relationships concepts for improvement concerning how to achieve improved service delivery, the expected useful academic and industrial outcomes are explored.

Key words: engineering/design service delivery, integrated approach, relationship management, supply chain relationship.

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Orgen *et al.* (2011) An integrated relationship and supply chain management framework for improving engineering and design service delivery to building contractors in Ghana *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 119-129.*

# AN INVESTIGATION INTO THE ACTIVITIES OF THE ENVIRONMENTAL PROTECTION AGENCY (EPA) IN THE GHANAIAN CONSTRUCTION INDUSTRY: A CASE STUDY OF SEKONDI-TAKORADI METROPOLIS

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A study was conducted with the purpose of investigating into the activities of the Environmental Protection Agency (EPA) in order to ascertain the extent of enforcement of the Environmental Protection Agency Act in the Ghanaian Construction Industry. A literature review focused on environmental management and impact assessment, the Environmental Protection Agency Act and their relationship with the construction industry. Closed-ended and open-ended questions were posed and sent to purposive sampled construction industry stakeholders in the Sekondi-Takoradi Metropolis. Also a structured interview was conducted for an official from the Environmental Protection Agency in Sekondi-Takoradi. It emerged from the studies that more than 50% of the stakeholders, most of who were in the building sector, had never obtained an Environmental permit. Again it was noted that most of the stakeholders in the construction industry were aware that obtaining an Environmental permit was not a prerequisite for the execution of building projects. It was concluded that it was a fact that a lot more had to be done by the EPA regarding monitoring of construction activities and the enforcement of the Environmental Protection Agency Act. The strict enforcement of the Environmental Protection Agency Act, increase in publicity on Environmental Management, reduction in the duration between applying for an environmental permit and receiving it and banning the use of environmentally unfriendly materials were the recommendations made after the research; as these would help improve environmental quality in the Ghanaian Construction Industry.

Keywords: Environment, Environmental Protection Act, Environmental Protection Agency, Ghana, Sekondi-Takoradi.

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# AN INVESTIGATION ON WHY ADJUDICATION IS NOT A POPULAR DISPUTE RESOLUTION METHOD IN THE GHANAIAN CONSTRUCTION INDUSTRY

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Adjudication as a method of dispute resolution in the Ghanaian construction industry is almost non-existent, mainly due to the fact that no legislative instrument has been passed in relation to it [1]. The contrary can be said about arbitration, which attained parliamentary ascent in 1961. Adjudication and arbitration as construction dispute resolution methods were compared to ascertain why the latter is more popular once a dispute arises during the execution of a construction contract, despite the fact that the time frame for making an award on an arbitration case is almost unlimited[2], whilst a case referred to adjudication (according to the UK technicalities) should last no more than 28 days (or a maximum of 42 days if the adjudicator makes a request and both parties agree)[3]. In all, 50 questionnaires were administered to construction experts consisting of 30 contractors, 10 quantity surveyors and 10 architects. The survey consisted of 15 statements that measured the parties' attitude and opinion in relation to their perception of adjudication and arbitration as construction dispute resolution tools in the Ghanaian construction industry, with the respondents indicating their level of agreement of each statement on a 5 level scale. It was found from the survey conducted, that adjudication is not as popular as arbitration because there is not enough knowledge on it. Therefore a conscious effort must be made by all major stakeholders affiliated with the Ghanaian construction industry to disseminate information about adjudication to its members.

Key words: construction dispute, adjudication, construction contract, award.

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# AN INVESTIGATIVE STUDY OF THE IMPACT OF DISTANCE AND DEMOGRAPHIC VARIABLES ON THE PRICE OF CEMENT

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Distance appears to be the major obstacle to overcome in most economic activities, since spatial disparity occurs between the points of demand and supply. Cement a core construction material has to be transported from points of manufacture to final consumption locations. The impact of locational variations on total cost of construction products, is a solemnly imputed factor at bidding and tendering stages, tender figures are fixed with reference to administrative headquarters, even when the projects are in other locations. The study investigates the impact of the following variables on the price of cement: (i) The distance from administrative capital (Port Harcourt) to other locations. (ii) Population (iii) Geographical size (iv) The population density of these locations. The research methodology obtains data of mean price values of cement, in locations outside the administrative quarters through primary sources. Data for the variables of distance, population and geographical sizes of locations are effected through secondary data source. The research employs the statistical tool of regression, for the analysis of data. The research concludes that variables, did not significantly impact on the prices of cement and that price necessitated by spatial disparities of locations are explainable by other variables. It recommends that cement availability should take into cognizance the volume of construction and other economic activities.

Keywords: demographic variable, economic variable, price of cement, transportation.

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# AN OVERVIEW OF HUMAN SETTLEMENT IN NIGERIA: A RAY OF HOPE FOR THE SLUM DWELLERS?

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Provision of affordable housing to its citizens has remained the principal focus of every successive government in Nigeria. This is because of the pivotal role played by housing in national development, advancement and growth on one hand and its being a necessity in the life of the people, on the other. The Nigeria housing problem basically relates to quantitative and qualitative inadequacies regardless of the various government policies that have been formulated in the past towards overcoming the huge shortage through several Housing Reform Programmes. Despite these past efforts, adequate housing provision continues to be an illusion to ordinary Nigerian. This paper reviews housing in Nigeria; the policies and agencies supporting housing delivery in Nigeria, such as the Government, private sector and others. Slum upgrading and other issues helping the delivery of affordable and adequate housing in Nigeria is also discussed. Based on the above, the success achieved to date is compared with the support received and the lessons learnt to date are also presented. The paper is mainly a literature review/survey. Finally, the paper closes with some recommendations for the future.

Keywords: housing, Government policy, Nigeria, slum, slum upgrading.

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Aigbavoa, C. and Thwala, W. (2011) An overview of human settlement in Nigeria: A ray of hope for the slum dwellers? *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 167-179.*

# ASSESSING THE IMPACT OF THE NATIONAL BUILDING REGULATION, 1996, L.I.1630 IN GHANA

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The development of the National Building Regulation was based on the ideas and objectives of a new national policy. It is a complicated document with far reaching consequences. The Regulation has been in existence for well over ten years now yet, it is within this same period that the nation (Ghana) has witnessed high level of collapse of structures, flooding and fire outbreaks. This research paper, therefore, looks at the impact of the National Building Regulation ever since its passage into law and what can be done to reverse the current trend. Pertinent areas such as; location of buildings, structural stability, structural fire precaution and obstructions and hazards in means of escape as stipulated in the Regulation were considered. After analysing data and testing of scientific hypothesis, the results establish that the National Building Regulation has not made the needed impact due to poor adherence. The results further establish that poor construction practices leading to collapse of structures, fire outbreaks and flooding are as a result of non-adherence to the National Building Regulation.

Keywords: flooding, Ghana, National Building Regulation.

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# ASSESSMENT OF PATRONAGE OF NATURAL HISTORY MUSEUM, OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA

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This study examined the extent to which tourism sites on Obafemi Awolowo University Campus particularly Natural History Museum have attracted patronage and its contribution to the development of the built environment of the University Campus. Data for this study were sourced through primary and secondary sources. From the physical survey, tourist sites were identified on the Campus and these formed the sample frame of the eight study. However, a detailed survey was carried out on the Natural History Museum which formed the sample size. The survey was carried out through physical survey and questionnaire administration in order to assess its patronage pattern over a period of twelve weeks. 320 questionnaires were administered to collect the primary data from tourists that visited the Natural History Museum during the working days only. From the questionnaire administered the purpose of patronage, frequency of visit and time spent at the museum were determined through data analysis. Analysis showed that 25.6% patrons came to the museum for sightseeing, 24.4% for personal relaxation and 35.4% visit for educational and research purposes. The secondary data obtained from the register of attendance showed a decline from a total number of 13,747 patrons in 1998 to 8,444 in 2005. It was observed that the exploitation of the identified tourism potentials on the University campus would attract more patrons, even of varying age, educational and occupational distributions for the overall development of the Campus. The study suggested ways by which the potentials of tourism could be achieved through proper exploitation, investment and management to enhance the development of the University community and her built environment.

Keywords: environment, Ile-Ife, museum, tourism, tourist site, tourist.

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Omisore, O.E. (2011) Assessment of patronage of Natural History Museum, Obafemi Awolowo University, Ile-Ife, Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 183-192.*

# BIOCLIMATIC AND DESIGN STRATEGIES ANALYSIS TOWARDS THE IMPROVEMENT OF COMFORT IN SEMI-DETACHED HOUSES IN GHANA

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A 10 month period of monitoring temperature and relative humidity values in semi-detached houses on the campus of the Kwame Nkrumah University of Science and Technology in Kumasi was studied. The thermal conditions prevailing in the spaces were analysed using recommended design strategies to achieve comfort, as well as the Bioclimatic Chart, modified for warm countries. The main purpose was to find out which of the sustainable design strategies (thermal mass, night ventilation, comfort ventilation, evaporative cooling, etc) and air velocity would have a commensurate effect on thermal comfort in Ghanaian semi-detached houses. The results showed that the most effective design strategy would be comfort ventilation. Further, the plots on the Bioclimatic Charts resulted in the use of an air velocity of  $0.5\text{m.s}^{-1}$  to attain comfort. This outcome implied that designers ought to enforce passive design recommendations in the orientation, placing of building elements and the use of efficient systems.

Keywords: bioclimatic, psychrometric, thermal comfort, ventilation.

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# BUILT ENVIRONMENT EDUCATION AND RESEARCH IN WEST AFRICA

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Built environment programmes in West African universities; and research contributions from West Africa in six leading international journals and proceedings of the WABER conference are explored. At least 20 universities in the region offer degree programmes in Architecture (86% out of 23 universities); Building (57%); Civil Engineering (67%); Estate Management (52%); Quantity Surveying (52%); Surveying and Geoinformatics (55%); Urban and Regional Planning (67%). The lecturer-student ratio on programmes is around 1:25 compared to the 1:10 benchmark for excellence. Academics who teach on the programmes are clearly research active with some having published papers in leading international journals. There is, however, plenty of scope for improvement particularly at the highest international level. Out of more than 5000 papers published in six leading international peer-reviewed journals since each of them was established, only 23 of the papers have come from West Africa. The 23 papers are published by 28 academics based in 13 universities. Although some academics may publish their work in the plethora of journals that have proliferated in recent years, new generation researchers are encouraged to publish in more established journals. The analyses of 187 publications in the WABER conference proceedings revealed 18 research-active universities. Factors like quality of teaching, research and lecturer-student ratio, etc count in the ranking of universities. The findings lay bare some of the areas that should be addressed to improve the landscape of higher education in West Africa.

Keywords: built environment, education, research, university, West Africa.

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Laryea (2011) Built environment education and research in West Africa *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 203-214.*

# **CAPACITY-BUILDING IN CONTRACT ADMINISTRATION: KEY TO EFFECTIVE UTILIZATION OF DISTRICT ASSEMBLY COMMON FUND OF INFRASTRUCTURAL DEVELOPMENT**

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The aim of the study is to examine the utilization of District Assembly Common Fund (DACF) under the capacity- building in contract administration to infrastructural developments. A capacity-building course in contract administration was organized for the staff of the Tender Boards of twelve District Assemblies in the Brong-Ahafo Region of Ghana. A self-reported instrument was used to measure participants' knowledge on contract administration. Sixty-nine per cent of the participant agreed that they had never attended any training in contract administration and 31 per cent had no knowledge about contract administration. However, 99 per cent participants agreed that capacity building would help them to overcome the deficiencies in the administration of infrastructural projects in their District Assemblies. It is recommended that training seminars and workshops should be organized for all relevant contract administration staff in District Assemblies as a matter of government policy.

Keywords: contract administration, District Assembly, District Assembly Common Fund, Tender Board.

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# CASUAL WORKERS PREFERENCE OF OCCUPATIONAL HEALTH AND SAFETY ITEMS ON BUILDING CONSTRUCTION SITES IN GHANA; A KUMASI STUDY

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The Ghanaian construction industry noted as a provider of employment and as a driver of economic growth is fraught with occupational health and safety issues. Employers of casual workers provide them substandard welfare facilities and safety materials. This paper aimed at the establishment of preference of casual workers to the provision of substandard welfare facilities and safety materials. Observations followed by a questionnaire survey were used to elicit from casual workers on their preference for occupational health and safety items involving their engagement. The items were grouped under two major thematic areas, namely welfare facilities and safety items, and the casual workers were asked to indicate their preference on 5-point rating scale. The findings reveal that, the casual workers preference for welfare facilities were in the order of safe drinking water (ranked 1<sup>st</sup>), suitable accommodation for resting (ranked 2<sup>nd</sup>), sanitary facilities (ranked 3<sup>rd</sup>), first-aid equipment (ranked 4<sup>th</sup>) and water for washing (ranked 5<sup>th</sup>), while for safety items the following emerged; safety boots (ranked 1<sup>st</sup>), safety signs (ranked 2<sup>nd</sup>), hard hats or helmet (ranked 3<sup>rd</sup>), training in safety (ranked 4<sup>th</sup>) and safety glasses (ranked 5<sup>th</sup>). One sample statistics supported the findings suggesting that the findings could have wider relevance in Ghana. Given that casual workers now account for about 70-90% of the construction labour workforce in Ghana. The findings have implications for both contractors' safety management strategies and also policy direction in future safety guidelines for improving health and safety practices on Ghanaian construction sites.

Keywords: casual worker, occupational health and safety.

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# CAUSES OF VARIATIONS ON BUILDING PROJECTS IN NIGERIA

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Variations are inevitable reality of every construction project. Variations in construction projects can cause substantial adjustment to the construction project duration, cost and quality. The aim of this study is to examine causes and possible control measures of variations in the Nigerian construction industry. Data on recently completed projects were collected from clients, consultants and contractors in the construction industry in Nigeria. A total number of seventy five (75) questionnaires were distributed out of which sixty five (65) were returned for analysis. The data collected were analyzed using descriptive statistics. Change of plan or scope of work by owner, change of specification by owner, unforeseen problems, change in economic conditions and differing site conditions were identified as the major causes of variations. While involvement of professionals at initial stages of project, clear and thorough project brief, thorough detailing of design, team effort by the owner, consultant and contractor, also comprehensive site investigation are major possible control measures of variations in the Nigerian construction industry. In conclusion, to minimize variations, client and consultants must be actively involved in the planning stage of construction project and the collaborative effort of the construction professionals should be encouraged with site investigation carried out during the pre-contract stage.

Keywords: cost overrun, Nigeria, time overrun, variations.

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Babalola, J.A. and Idehen, A.F. (2011) Causes of variations on building projects in Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 229-236.*

# CHALLENGES FACING THE SMOOTH IMPLEMENTATION OF GHANA'S PUBLIC PROCUREMENT LAW, 2003, ACT 663

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The Public Procurement Act (Act 663) is an ACT passed in 2003 to regulate public procurement in Ghana. The purpose of this law was to promote fairness, transparency and ensure that public procurement is carried out in non-discriminatory manner. The adoption of the Act has been faced with several challenges since its introduction in 2003. The aim of this study was to identify various bottlenecks hampering the smooth implementation of the law and attempt to suggest possible remedies for identified challenges. The study adopted multiple research approach; which include; review of relevant literature, interview and questionnaire survey of 49 District Assemblies and Metropolitan and Municipal Assemblies in the Ashanti and Brong Ahafo Regions of Ghana. The study identified; inadequate funding, political interference, poor dissemination of procurement information, low capacity of procurement managers were identified as the major challenges to the smooth implementation of the public procurement law in Ghana. The ability of procurement officials to ensure strict conformance with the law without political interference, would ensure that the objects of the Law are achieved.

Keywords: Ghana, public procurement, Public Procurement Authority, Public Procurement Act.

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Ameyaw, C., Mensah, S. and Osei-Tutu, E. (2011) Challenges facing the smooth implementation of Ghana's Public Procurement Law, 2003, Act 663 *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 237-247.*

# CLAY EXPLORATION, AESTHETICS AND ENVIRONMENTAL SUSTAINABILITY: A CASE STUDY OF AKURE AND ADO-EKITI, NIGERIA

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Clay, known by so many names, is one of the oldest building materials that are ubiquitous. Ancient as it is, clay, due to its physical as well as chemical properties, can be further explored for the aesthetics and sustainability of the built environment most importantly in the tropics where the temperature is dynamic. This paper therefore aimed at identifying the various uses to which clay can be put and a number of applications of clay either in its original form or as a processed and finished product for aesthetic or/and utility value especially as it relates to the built environment. To achieve this aim, relevant literature were reviewed to expose the varieties of clay and its environmental compatibility, the various procedures and techniques for transforming clay and the various end-uses to which clay could be put with particular emphasis on the built environment. A survey was also conducted through the administration of questionnaires in Akure and Ado-Ekiti (both in the South/Western Nigeria) to find out the extent to which clay is used either as aesthetic material or for the sustainability of the built environment. Based on the analysis and discussion of the results of the survey, the paper recommended the encouragement of the continuous use of clay for its environmental sustainability and aesthetic values in the built environment. Clay was also recommended for use based on its ability to assist in ameliorating some of the negative effects of climatic changes.

Keywords: Ado-Ekiti, Akure, clay, laterite, sustainability, aesthetics.

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Olubunmi, G.S. and Abiodun, G.S. (2011) Clay exploration, aesthetics and environmental sustainability: a case study of Akure and Ado-Ekiti, Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 249-249.*

# CLIENT-ARCHITECT BEHAVIOURS TOWARDS COST ADVICE IN NIGERIA: QUANTITY SURVEYORS' PERSPECTIVE

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Cost advice (CA) during early stage of building projects is an imperative to achieving value for money, but receives little consideration in the Nigerian Construction Industry (NCI). Construction clients and architects are foremost beneficiaries of this function and contributor majorly to its success or failure. Problems related to the 'cost advice' function significantly contribute to some of the inefficiencies and non-performances crippling NCI. This paper investigates 'behaviours' of clients and architects as they relate to the 'cost advice' function of quantity surveying (QS) practice. Data were gathered from 248 projects sought from quantity surveying firms. Descriptive statistics, correlation analysis and test of significance were carried out. Based on these outcomes regression analysis was employed to establish the impact of the behaviours to the outcome of 'cost advice' function. Behaviours relative to engaging QS and provision of design information were found to be 'slightly less than normal' while services required from the QS comes with some challenges. Based on the strength of the impact of these behaviours on CA outcomes, it is suggested that certain behaviours must be tightly monitored and improved upon to ensure success of the CA services offered by the QS during early stage of building projects.

Keywords: client-architect behaviour, cost advice, quantity surveyor.

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# CONSTRAINTS IN REAL ESTATE DEVELOPMENT FINANCE IN GHANA

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Corporate Real estate finance in Ghana is fraught with problems emanating from infrastructural inadequacies with a preponderance of equity finance. Property owners use their own equity, barter arrangements and remittances from abroad to finance substantial volumes of their investment. Poor access to debt finance relates to demand-side problems, particularly a lack of information about available sources, rather than a lack of available credit. The financial market, however, is critical to the development of the real estate industry. The aim of the research is to identify and analyze the nature and the causes of financial market constraints in corporate real estate development in Ghana. A questionnaire survey and interviews were conducted to ascertain from corporate real estate developers and financial institutions (commercial banks, development, merchant banks) the underlying causes of difficulties in real estate finance. Financial constraints are identified under demand and supply of debt and equity finance as well as information and knowledge constraints.

Keywords: corporate real estate, debt, equity, financial constraint.

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Appiagyei, N.B. and Dansoh, A. (2011) Constraints in real estate development finance in Ghana *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 261-271.*

# CONSTRUCTION PARTICIPANTS' PERSPECTIVE ON MULTI-CRITERIA SELECTION PRACTICE IN LAGOS STATE, NIGERIA

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The awards of contract to qualified contractor contribute to its successful delivery, which is a desirable goal of every construction participant. However, in Nigeria the award of contract has been perceived as lacking transparency which makes the adoption of multi-criteria selection practice in contractors' selection a viable option. This study investigates the perception of the construction participants on the use of multi-criteria selection practice. The research method involves the review of literatures and administration of structured questionnaires to construction participants using a purposive sampling technique. The data were analyzed using descriptive analysis while mean items score was used to present responses obtained on a modified Likert scale instrument. The study revealed that most organizations viewed prequalification as a standard procedure for the execution of construction projects. In addition, the decision criteria and evaluation of contractors are considered to be based on the size, type and complexity of projects while both clients and contractors are found to benefit from multi-criteria selection practice. The study recommends that prequalification of contractors must be done periodically for developing a standing list of contractors.

Keywords: contractor selection, multi-criteria selection, Nigeria.

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Alabi, F.O. (2011) Construction participants' perspective on multi-criteria selection practice in Lagos State, Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 273-279.*

# **COST IMPLICATIONS OF BIODEGRADATION OF KHAYA GRANDIFOLIOLA (DRY LAND MAHOGANY) BY ASPERGILLUS SPP IN RESIDENTIAL BUILDINGS**

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Degradation of timbers in building due to microorganisms was reported to cause enormous economic loses and species of *Aspergillus* are among the major contributors to the degradation of timbers in Nigeria. This research aimed at evaluating cost of implications of the biodegradations of *Khaya grandifoliola* by *Aspergillus* spp in residential buildings empirically. Decayed *Khaya grandifoliola* samples were collected on residential buildings to extract, cultivate and identify the *Aspergillus* spp present. The cultivation went through serial dilutions and inoculations on sabouraud dextrose agar in petri dishes for 72 hours at 30°C. The species were identified through visual and microscopic observations. Percentage rate of degradation were determined under controlled laboratory conditions by inoculating known weights of *Khaya grandifoliola* with the *Aspergillus* spp and incubating in a minimal medium for 24 weeks at 30°C. Weight loses and spore counts were recorded at 4 weeks intervals. A pattern of the degradation was forecasted for 24 months. an accumulative weight lost of 16% for this period was obtained. Methods and costs of repair and replacement of the decayed portions were investigated. Residential Buildings constructed of *Khaya grandifoliola* will experience considerable high cost of maintenance if conditions favourable to the *Aspergillus* spp.

Keywords: *Aspergillus*, biodegradation, cost, *Khaya grandifoliola*, residential building.

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Imbeah, K.A. and Dansoh, A. (2011) Cost implications of biodegradation of *Khaya grandifoliola* (dry land mahogany) by *aspergillus* spp in residential buildings *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 281-289.*

# CRITICAL SUCCESS FACTORS FOR THE IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT (TQM) IN REAL ESTATE DEVELOPMENT IN GHANA

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Research in recent times has come up with accounts of successful and unsuccessful efforts at implementing TQM, with growing interest in identifying elements of management that account for successful implementation of TQM. Most current studies focus on superior quality companies in advanced industrial environments, leaving companies in the developing economies largely unstudied. This paper identifies the critical factors contributing to the successful implementation of TQM in real estate firms in Ghana. A survey of 62 real estate development companies registered with the Ghana Real Estate Developers Association (GREDA) was conducted to establish managers perception of factors required for a successful implementation of TQM.. Eleven factors were identified, viz: Top management commitment and leadership, Employee welfare and commitment, Employee training and development, Customer focus, Planning, process control and process evaluation, Supplier management, Continuous Improvement, Team Work, Information analysis and evaluation. These are factors to be given attention to minimize difficulties related to the implementation of total quality management and ensure the successful implementation of total quality management in this industry.

Keywords: Total Quality Management, critical success factor, real estate, Ghana.

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Imbeah, K.A. and Dansoh, A. (2011) Critical success factors for the implementation of Total Quality Management (TQM) in real estate development in Ghana *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 291-303.*

# DESIGNS AND CONSTRUCTION OF BUILDINGS IN GHANA: THE DISABILITY FACTOR

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It is estimated that 10% of Ghana's population suffer from some form of disability. The blind, deaf and physically disabled people are the most visible. Despite the magnitude of the disability percentage of the population, most designers and constructors in Ghana fail to factor the disabled people. It is against this background that many saw the passage of the Disability Bill into law in June 2006 by Parliament as the turning point for the disabled people regarding design and construction of buildings in Ghana. This study examines the extent to which the disability is factored in designs and construction of buildings in Ghana. To achieve the study objectives, a comprehensive literature search and survey was carried out in the Accra metropolis among property owners and People Living with Disability (PWD). Interviews were also conducted using an interview guide for Estate Developers, Architects and Engineers as well as officials from the Law Enforcing Agency (Accra Metropolitan Assembly & Town and Country Planning) to solicit their views. The results suggested that though the disability law has been passed almost all estate developers or construction companies are not seriously factoring disabled people in their construction designs. The study concluded that, massive education should be embarked upon by all stake holders in educating the general public, professionals and clients about the importance of the disability law and the need to make buildings disabled friendly.

Keywords: design, Disability Law, disabled friendly, inclusive design.

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# DESIGNING OUT WASTE ON MASS HOUSING CONSTRUCTION SITES IN MINNA, NIGER STATE

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The need to minimize or eliminate waste in mass housing designs in order to construct quality houses and meet housing demand in Minna is unavoidably essential. The nascence of designing out waste; the smearing of design errors that compound design waste and the unawareness of construction stakeholders are issues in contention. The aim therefore is to examine construction waste caused by roof design errors complicated by improper building orientation viz a viz their remedial solutions; with a view to provide explanations on reducing construction waste on mass housing sites in Minna. Field investigations of waste routes were conducted. At the same time, the nature and extent of waste were determined. Changes in roof designs and introduction of columns in walls were critically enumerated and discussed to explicate some current and needed strategy for designing out waste in Minna. It found that waste routes originate from the structural and aesthetical objectives of architectural design. In addition to building and material complexity, immaterial complexities such as building orientation can also cause waste. Following from this, designing out waste is not only interested in reducing waste, but also in reducing environmental impacts on building and material components. Designing rightly from the onset with simple plans and building components eliminate the need to repeat work and therefore designing out waste strategies are better predefined and not post defined.

Keywords: architectural design, construction waste, design waste, mass housing.

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Olaniyan, O.A. (2011) Designing out waste on mass housing construction sites in Minna, Niger state  
*In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 315-323.*

# **DIESEL (AGO) PUMP PRICE INCREASE AND THE PRICES OF SELECTED BUILDING MATERIALS IN NIGERIA 1990 – 2009**

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This paper investigates the effect of increase in diesel pump price on the prices of selected building materials in Nigeria. The objective is to establish the statistical relationship existing between diesel price increase and the price of selected basic building materials. Using a simple interactive polynomial method and working at 95% confidence limit a computation was made of the research variables. The result showed a significant relationship between the variables tested. Also the result revealed different degrees of relationships of the variables analyzed. Prices of cement, blocks and paint had linear, quadratic and cubic relationships respectively with increase in diesel price. Coefficients of determination of 96.04% for cement, 96.63% for blocks, 95.76% for iron rod, 94.52% for paints, 90.12% for sharp sand and 96.49% for timber were discovered for these tested variables. The results of the study indicate that the relationships were either linear or non linear in the tested variables. This reveals that diesel price increase will cause the price of building materials to rise at various degrees, thereby exerting an enormous financial pressure on the building developers as a result of its multiplier effects on haulage and production of building material. Therefore government fuel price hike policies should be implemented with caution in order to prevent rise in prices of building materials.

Keywords: building material, diesel price, energy, price hike, road haulage.

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Idiake, J.E. (2011) Diesel (ago) pump price increase and the prices of selected building materials in Nigeria 1990 – 2009 *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 325-333.*

# DRIVERS FOR ESTIMATING CONSTRUCTION COSTS OF INSTITUTIONAL BUILDING PROJECTS IN NIGERIA

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Central to cost based competition is the capability to accurately predict the cost of delivering a project at the early stage. Early cost estimates are important for project feasibility studies, budget allocation decision and even final project success. The accuracy and reliability of such estimates largely depend upon the selection and the use of relevant predictor variables for estimating. This study identifies and proposes through empirical means the use of relevant cost drivers for accurate and reliable cost estimating of institutional building projects in Nigeria based on 510 sets of detailed project data. Relevant cost drivers extracted from related literature were examined through a field survey. Nine cost drivers were identified by experts. They are the building height, compactness of the building, expected construction duration, external wall area, gross external floor area, number of floors, Proportion of opening in external walls, location and time indices. Backward regression analyses (linear and semi-log) were employed incorporating these relevant variables to predict construction costs. The results of the analysis revealed that the transformed regression model predicted likely construction costs of randomly selected projects with Mean Absolute Percent Error (MAPE) of 9.76%. The result also showed that the variable gross external floor area has the greatest explanatory significance with construction cost.

Keywords: cost drivers, cost estimating, institutional building, regression.

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# DYNAMICS OF EMPOWERMENT IN PROJECTS

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To better understand the implications of empowerment's multifaceted nature in a complex setting such as the project environment, we invoke complexity paradigm as a theoretical lens that is well positioned to help capture the essence of empowerment. From this theoretical framework, the true nature of how empowerment can intertwine with the complex and uncertain project context can be captured and described from the perspective of the workforce or actors engaged in the creation, execution, and closure of the project. Three preeminent questions that can aid this line of enquiry emerge from this review; how can organisations empower employees at different levels simultaneously within the same project team and still achieve goal congruence?; how does the changing nature of the project life cycle impact on employee empowerment experiences?; and what does the multidimensional perspective on empowerment add to our knowledge of empowerment in organisations? Empowerment varies depending on the targeted population, the targeted setting and also fluctuates across time. These perspectives have rarely been examined simultaneously and no theoretical framework has as yet articulated such an integrative perspective in any specific setting. The complex and dynamic nature of the project environment and the project life cycle in particular have significant implications for understanding how empowerment manifests in projects.

Keywords: empowerment, complexity theory, project life cycle.

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# EFFECT OF OIL COATING ON STEEL BAR ON THE STRENGTH OF REINFORCED CONCRETE

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The strength of steel-reinforced concrete greatly depends on the adequacy of the bond between concrete and steel reinforcement and this can be impaired by the surface condition of reinforcing steel. Oil on the surface of steel reinforcement has been mentioned to potentially have an adverse effect on steel-concrete bonding action and consequently structural performance, but this effect remains to be buttressed empirically. This study thus considered the effect of the surface condition of deformed mild steel bar on the bond strength and the flexural strength of steel-reinforced concrete, with the surface condition being engine oil coating. Bond and flexural test involving concrete embedded with steel bars coated with engine oil and un-coated steel bars (i.e. bars not coated with engine oil) revealed that engine oil coating considerably reduces the bond and flexural strength of reinforced concrete. Steel reinforcement during storage and installation should thus be protected from contamination by oiling agents.

Keywords: bond, oil-coated rebar, reinforced concrete.

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Adukpo, E., Oteng-Seifah, S., Manu, P. (2011) Effect of oil coating on steel bar on the strength of reinforced concrete *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 361-369.*

# EFFECT OF REPLACEMENT OF SAND WITH GRANITE FINES ON THE COMPRESSIVE AND TENSILE STRENGTHS OF PALM KERNEL SHELL CONCRETE

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Lately, research works are being focussed on using renewable agricultural waste resources as construction materials. This is to ensure sustainability and to reduce cost of construction. Palm kernel shell concrete (PKSC) is concrete containing cement, sand and palm kernel shells wholly or partially as a coarse aggregate. This paper therefore presents results of an experimental laboratory investigation carried on PKSC by incorporating varying percentages of granite fines to replace sand in steps of 20% to study its effect on the compressive and tensile strength of PKSC. A mix proportion of 1:1.77:0.77 was used with a w/c = 0.50. Calcium Chloride (CaCl<sub>2</sub>) was added as an accelerator. Results of 28-day strength test using 100 mm cubes and 150 × 300 mm cylinders revealed that the compressive and tensile splitting strengths increased with curing age and with increase in the percent granite fines content. Maximum compressive and tensile splitting strengths were obtained for PKSC containing 100% granite fines. Tensile strength obtained fall within the range of values (1.24-1.90 N/mm<sup>2</sup>) given for grade 30 concrete.

Keywords: renewable resources; palm kernel shell; compressive strength; water absorption; palm kernel shell concrete.

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Babafemi, J.A. and Olawuyi, J.B. (2011) Effect of replacement of sand with granite fines on the compressive and tensile strengths of palm kernel shell concrete *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 371-378.*

# EFFECTS OF NIGERIAN RICE HUSK ASH PRODUCED USING A CHARCOAL FIRED INCINERATOR ON PROPERTIES OF CEMENT MORTAR AND CONCRETE: PRELIMINARY RESULTS

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The effects of Nigerian rice husk ash (NRHA) produced in a prototype charcoal fired incinerator and milled to a specific surface of 235m<sup>2</sup>/kg, on properties of cement mortar and strength properties of concrete are presented in this work. Effects of NRHA on properties of cement mortar were investigated at 0-40% replacement levels at 5% intervals by weight of ordinary Portland cement (OPC). The results indicate that standard consistence water content increases linearly with the NRHA content increases. There were remarkable increases in initial and final setting times of the cement mortar that peaked at 10% NRHA replacement; above 10% content, continuous decrease in initial and final setting times were observed. There is no recorded unsoundness in the cement paste at the replacement levels investigated. The effects of the NRHA on concrete strength at different hydration periods and water/binder (w/b) ratio show that compressive strength gains are dependent on w/b ratio.

Keywords: compressive strength, concrete, rice husk ash

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# ENERGY GENERATION AND CONSUMPTION IN GHANA

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Electricity consumption in Ghana is estimated to be increasing by 10% per annum due to the demand from the growing population. However, current sources of production (hydro and thermal facilities) generate only 66% of the current demand. Considering current trends, it is difficult to substantiate these basic facts, because of the lack of information. As a result, research into the existing sources of generating electricity, electricity consumption and prospective projects has been performed. This was achieved using three key techniques; review of literature, empirical studies and modelling. The results presented suggest that, current annual installed capacity of energy generation (i.e. 1960 MW) must be increased to 9,405.59 MW, assuming 85% plant availability. This is then capable to coop with the growing demand and it would give access to the entire population as well as support commercial and industrial activities for the growth of the economy. The prospect of performing this research is with the expectation to present an academic research agenda for further exploration into the subject area, without which the growth of the country would be stagnant.

Keywords: energy, electricity generation, electricity consumption, Ghana.

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# ENHANCING THE IMAGE OF TRANSPORT TERMINALS IN GHANA

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A study was conducted with the aim of exploring and understanding intra-city transport terminals and their impacts on users. The research specifically studied the Old Tafo Lorry Park in Kumasi, Kaneshie Station in Accra, and Anaji *trotro* Lorry Park in Takoradi, examined their location and management problems and level of congestion. A literature review focused on exploring transport terminals, interviews, questionnaires and personal observations were used in the study. The study discovered that the terminals at Old Tafo and Kaneshie in Kumasi and Accra respectively are sited next to markets, where various economic activities including vibrant buying and selling occur, while, the Anaji *trotro* terminal in Takoradi is found within residential areas located in streets, clearly suggesting that no consideration was given to the development of public transport terminals. Seventy four percent of the respondents described the facilities at the terminal as poor yet they are of the view that the location of the terminals be maintained due to their proximity to markets. The large number of vehicles that use the terminals in the morning and evening peak hours result in congestion at the terminals. The study concluded that the vehicular-pedestrian conflicts at the terminals could be controlled if adequate infrastructure and services are provided at the terminals. The study increased awareness of the managers of the terminals on the need to provide security at the terminals, comfort to patrons and to reduce vehicular and pedestrian conflict.

Keywords: commuters, Ghana, intra-city, terminals, transport.

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# ESTABLISHING A MAINTENANCE COST PROFILE OF RESIDENTIAL BUILDINGS

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Regular maintenance ensures restoration of building components. It is a sinequanon to longevity of building fabrics. The work attempts to establish a maintenance cost profile. It appraises the existing relationship between maintenance cost and the variables of gross floor area, the age of building, population densities of residential buildings in Warri Metropolis (an oil rich city in the Niger Delta region of Nigeria). The work obtains data for the variables through primary source. It uses the statistical tool of regression in the analysis of data. It concludes that the variables of floor area, population, population density do not significantly impact on maintenance cost. Whilst the variable of age, impact significantly on maintenance cost. It recommends that in planning of maintenance schedule cognizance should be given to age of building; the frequency should increase as the age increases.

Keywords: maintenance, maintenance cost variable, maintenance management.

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Mac-Barango, D.O. and Kakulu, I.I. (2011) Establishing a maintenance cost profile of residential buildings *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 413-425.*

# ESTABLISHING THE COMPRESSIVE STRENGTH OF SANDCRETE BLOCKS PRODUCED IN THE CENTRAL REGION, GHANA

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Sandcrete block is one of the common materials used in constructing buildings as walling units in Ghana. Most of these sandcrete blocks are produced by local block moulders. The quality of blocks produced, however, differs from each manufacturer due to the different methods employed in the production and the properties of the constituent materials. This research therefore, examines the methods of production and determines the strength of the sandcrete block in the Central Region of Ghana. Sandcrete blocks were taken from suppliers and tested for compressive strength, bulk density, water absorption, and dimension tolerances. Fine aggregate samples were also taken from the suppliers and tested for grading, silt, and organic matter content. The study confirmed that mix ratio, quality, and mixing of the constituent materials affected the quality of sandcrete blocks. The research findings revealed that sandcrete blocks producers that the research were conducted 30.40% of the standard crushing strength of sandcrete blocks. No factory where the research was conducted were able to scientifically state their strength of sandcrete blocks. The study confirmed that mix ratio, quality, and mixing of the constituent materials affected the quality of sandcrete blocks. Visual inspection rather than laboratory testing was adopted as the means of ascertaining the quality. The Engineering Department of Standard Board for the past two years has not inspected the quality of sandcrete blocks in the Central Region.

Keywords: Central Region, compressive strength, Ghana, Mix Ratio, sandcrete block.

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# EVALUATING THE BENEFITS OF BOT INFRASTRUCTURE PROJECTS IN NIGERIA

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Build Operate Transfer (BOT) in project management is particularly relevant in most of the developing countries of the African region including Nigeria. Most African countries required extensive infrastructure to meet the economic development challenges. Therefore, BOT stands as a tool for bridging the critical infrastructure gap without utilizing the public sector funds. However, BOT is a relatively new experience in most developing countries of the African region and Nigeria in particular where the experience of the public sector has not always been positive. Many studies shown that majority of BOT projects offered in Nigeria were failed at the procurement stage due to the high costs of procurement process among others. Although the federal government had taken various steps by establishing a PPP Unit called Infrastructure Concession Regulatory Commission (ICRC) towards realizing the possible benefits attributable to the BOT projects in the country. This paper is aim at investigating the factors influencing the high costs of BOT procurement process and the possible benefits of BOT projects based on the respondents' agreement. The survey findings will serve as a way of encouraging both the public and the private sector participation in the development of BOT projects for sustainable infrastructure development in the country. Using questionnaire survey, the opinions of respondents such as clients, consultants, developers, lenders, and users group were assessed. Reliability index was employed to measure the attribute of each factor. One-way analyses of variance (ANOVA) were also performed to test whether the mean values on each benefit were equal for all groups of respondents. The survey has empirically identified and ranked ten factors influencing the high costs of BOT procurement process. Twenty benefits of BOT projects were identified based on the respondents' agreement. Therefore the overall benefits will give the public sector leverage in facilitating infrastructure development within the shortest possible time scale.

Keyword: BOT, procurement, infrastructure, Nigeria.

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# EXPLORING WASTE MINIMIZATION MEASURES IN THE GHANAIAN CONSTRUCTION INDUSTRY

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The chronic problems of construction include low productivity, low quality, poor co-ordination and high costs. High product cost is also associated with poor quality, inefficiency and high waste generation. Various studies in the construction industry have developed best practices that are not only capable of improving organization's profit but also assist in producing systematic work processes which encourage the optimal use of resources. A structured questionnaire survey was conducted to provide empirical evidence on levels of significant contribution of waste minimization measures to waste reduction, and levels of practice of same measures using weighted average and coefficient of variation criteria. Purchasing raw materials that are just sufficient, using materials before expiry dates, and using more efficient construction equipment are perceived by construction professionals as three of twenty-six measures which most significantly contribute to waste minimization, and also the three most practiced waste minimization measures in Ghana. Encouraging re-use of waste materials, use of low waste technology and recycling of waste materials on site are, however, considered as the three least significant measures contributing to waste minimization and also least practiced. Among various suggested recommendations, the construction industry is encouraged to sort and re-use waste materials, and adopt environmentally friendly and low waste technologies on site. This paper presents measures which significantly contribute to materials waste minimization on construction sites in Ghana.

Keywords: Ghana, waste, waste minimization.

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# FACTORS AFFECTING WOMEN ENROLMENT IN CONSTRUCTION EDUCATION IN NIGERIA

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The Millennium Development Goals (MDGs), as reflected in the agenda of many African countries, have advocated for the empowerment of women in all aspects of the economy for them to be economically self reliance and active participant in decision making. While construction industry was found to be a major player in the economy of any nation, in Nigeria and indeed a review around the world indicates that all parts of this industry are male dominated. This paper reports on a study carried out on assessing factors affecting women enrolment in construction education in Nigeria. Structure questionnaires were used to collect data from targeted students, within and outside construction related disciplines, of Obafemi Awolowo University, Ile-Ife, Nigeria. The result indicates that respondents placed importance on the fact that women were not at the fore front and their impact or participation not been felt in construction sector. The issue of gender discrimination was also revealed as one of the problems confronting the very few women in the sector. The paper also presents charts showing the trend of women enrolment in construction as compare to those of men over a ten year period. The charts show that women enrolment over the years is extremely low. The paper concludes on the need to make concerted effort in the enhancement of women enrolment and eventual participation in construction.

Keywords: construction education, enrolment, Nigeria, women.

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Dada, J.O. (2011) Factors affecting women enrolment in construction education in Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 453-464.*

# FACTORS INFLUENCING LAND ACCESSIBILITY FOR HOUSING DEVELOPMENT IN ABUJA, NIGERIA

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Housing has been rated the second most important need for human development. Its accessibility has continued to pose serious challenges to policy makers and stakeholders in most developing countries. It was identified that land availability has been a factor militating against housing development in Nigeria. This study was conducted to assess the factors associated with land accessibility for housing development in the Federal Capital City (FCC) Abuja-Nigeria. The method adopted for this study included; use of questionnaire, collate records from land administrators and articulation of literature from books, journals, internet etc. Results obtained shows that 63.64% of the respondents applied for land in the FCC and 61.9% were denied. This was due to non-compliance (100%) with mode of application. Other factors included; financial constraints (75%), bank high interest rate (66.67%), apathy (33.33%), cumbersome application process, revoked due to delay in development of allocated land (50%) etc. It was concluded that 2/3 (two third) of the applications were denied, accessing loan from financial institution by the applicants for development is difficult, there is cumbersome application process etc. It was recommended that; land application for housing development should be encouraged and applicants given equal chances, government should encourage more active participation of the private sector in housing delivery, prolong procedure of land accessibility should be reduce, financial institutions should relax the stiff conditions laid down to obtain fund without high interest and collateral.

Keywords: Abuja, housing, land accessibility, Nigeria.

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# FACTORS INFLUENCING THE EXTENSIVE USE OF GLASS ON FACADES OF OFFICE BUILDINGS IN ACCRA, GHANA

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Sustainability has become a much discussed topic globally. It affects various aspects of our lives i. e. environmentally, socially and economically. Many parameters have been drawn to pursue sustainability in all aspects of human life. Sustainable construction is one aspect where these parameters have been set to enable stakeholders in the construction industries all over the world to be mindful of the way and manner construction is undertaken, in order to minimise the misuse of natural resources and pollution of the environment. Climatic forces have been an important factor ever since man first constructed shelter. The nature of buildings in Ghana which is in a tropical climatic region was initially dictated by the climatic conditions thus they were tailored to make the most use of the climatic elements to give comfort to occupants without compromising the environment. However with the advent of modern methods of construction, construction materials and mechanical aids like air-conditioning, extractor fans and artificial lighting, these climatic conditions have been relegated to the background, whilst building styles in other climatic regions have been copied. Glass is now being used extensively on facades of buildings, especially office buildings. The increasing use of glass on façades of office buildings in Accra (the capital city of Ghana) raises a few questions in relation to sustainable construction. In order to answer these questions there is the need to find out why the increased extensive use of glass in buildings.

Keywords: glass façade, sustainable construction, tropical building

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Ampadu-Asiamah, A.D. and Adjei, E.A. (2011) Factors influencing the extensive use of glass on facades of office buildings in Accra, Ghana *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 473-485.*

# FRAMEWORK ANALYSIS OF TECHNOLOGY AND DESIGN OF SUSTAINABLE AFFORDABLE HOUSING IN NIGERIA

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Architectural firms have a crucial part to play in the design of sustainable homes as majority of the decisions that drive the production of affordable housing and affect the buildings energy performance are made by architects, at the design phase. With advancement in technology and engineering, designers can evaluate the energy performance of a building at the early stage of designing building process. The code for sustainable homes was derived from a study organized by the government to aid the improvement and standards of new homes in the UK. Can this be utilized in Nigeria? For sustainable construction practices, designers should look at materials that were traditionally used by locals. With a huge housing shortfall in Nigeria and the government policy seemingly defective and unable to cope with demand due to budgetary constraints and other competing needs. The market economy approach along with flexible, efficient economic instruments are key factors to enable the construction industry to positively respond to sustainable development in terms of resource efficiencies and environmental protection in a developing economy. This research would aim to discuss the above and consider some possible solutions.

Keywords: affordable housing, environment, housing policy, sustainability.

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# FRAMEWORK FOR PERFORMANCE-BASED POST-OCCUPANCY EVALUATION OF EDUCATIONAL INSTITUTION BUILDINGS IN NIGERIA

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Performance-based criteria for post-occupancy evaluation (POE) for individual buildings are based typically on the stated design intent and criteria contained in or inferred from a functional program. Assessment of performance of buildings of institutions delivering higher educational services has become a matter of particular interest to governments seeking to increase the effectiveness of educational provision and maximize value for money. This paper presents the characteristics of important aspects of a performance evaluation approach related to higher education properties, with the aim of developing a general guideline for the POE practice specifically for institutional buildings in Nigeria. The main objectives are firstly, to review and analyse the government and institutional building performance, secondly, to determine the occupants' satisfaction level, thirdly, to determine the correlation between building performance and occupants' satisfaction level. It will evaluate specific aspects of planning and detailed design as well as match performance against design expectations within the ambits of budget for capital project in terms of function, accessibility, purpose, economy, aesthetics, experiences and environmental quality in institution of higher learning in Nigeria. Data required for the study will be mainly numerical and direct observations at the scene of occurrence.

Keywords: accessibility, economy, performance evaluation, post-occupancy evaluation.

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# **GENDER ISSUES IN LAND: IMPLICATIONS FOR HOUSING DEVELOPMENT IN NIGERIA**

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The basis of all development or construction is land and access to this gift of nature in most traditional African societies has been restricted from the female gender through the customary laws guiding its use and ownership. The factors of cultural attitude of male dominance, lack of inheritance rights, low education and income levels of the female gender have been found to reduce their participation in housing development. The aim of the study is to investigate how males and females secure access to land and housing in four selected ethnic groups in southern Nigeria with a view to ascertaining the existence of gender discrimination in access to landed property. Methodology includes administration of close-ended questionnaires to 1,518 indigenous homeowners across Akure, Benin City, Owerri and Calabar using cluster sampling, stratified and systematic random sampling techniques. Data analysis includes the use of Discriminant Function Analysis, Hypothesis Test for Difference in Proportion and Phi Correlation. Findings reveal that there is a significant relationship between gender and inheritance rights and that this has implications on housing development. Recommendations are made on promoting female participation in housing production and legal backing for women to ensure security of tenure in real estate development.

Keywords: gender, housing development, inheritance, land, southern Nigeria.

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# GEOSOPHIC PERSPECTIVE IN YORUBA URBANISM

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Geosophic consideration is important in achieving sustainable design for nations outside the western hemisphere. Such design is underpinned by the philosophy of mimesis. The research explored geosophy to understand the mimetic design principles in Yoruba urbanism. It adopted qualitative methodology. Data gathered through scoped literature and two hour each interview of seven Ifa educational system sages were analyzed using grounded theory to conceptualised Yoruba city design intents. Four categories of conceptual framework including “cosmological world view”, “harmonic ideal”, “seat of power” and “nodal symbol” were found to influence urban design in the study area. While “cosmological world view” emerged as the core category the remaining three constitute sub categories. The core hypothesis which stemmed from theory generation is that Yoruba urbanism is influenced by her cosmological world view. The cosmological world view is based on 16 sided polygonal cosmic urban forms with a square inset that corresponds to the cardinal points. Sustainable design in Yoruba cities must explore the prime position of architectural numerology that operates on “4”, “16” in ‘sense of place’ determination. This is in addition to the accommodation of bio-mimicry of the ecosystems and their living communities within the bioregion that naturally exhibit identified characteristics.

Keywords: cosmological world view, geosophy, geomantic planning, mimesis.

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# HEALTH AND SAFETY IN THE GHANAIAN CONSTRUCTION INDUSTRY: TOWARDS THE ESTABLISHMENT OF ROLES AND RESPONSIBILITIES OF KEY STAKEHOLDERS

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Efforts aimed at addressing the health and safety issues in the Ghanaian construction industry are not encouraging. This is because in the local contracts, the criteria for determining the competency of contractors and the subsequent evaluation of tender lays little or no emphasis on health and safety issues. It is true with other similar documents. This shows that from the outset of the construction project less attention is given to health and safety. The paper appraises the roles and responsibilities of key stakeholders on health and safety in the Ghanaian construction industry - in comparison with UK model – as a means of establishing best practice. The study focused on professionals in the Ghanaian construction industry. Primary data were obtained through structured questionnaire and informal interviews. The secondary data were also obtained through desk top study. The data were analysed using both qualitative and quantitative data analysis method. The study revealed that, management commitment to health and safety seems to be at the lowest side. It also came to light that UK construction industry is doing more to improve health and safety of construction workers than their Ghanaian counterparts. However it was conceded by the majority of the respondents that future adaptation of Construction (Design and Management) Regulations 2007 (CDM 2007) to suit local conditions by emphasising much on how roles and responsibilities concerning health and safety of duty holders are spelt out. It is recommended that health and safety should be made part of the criteria to select suitable contractor through tendering.

Key words: CDM 2007, health and safety, tender.

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# HISTORICAL OVERVIEW OF HOUSING PROVISION IN PRE AND POST INDEPENDENCE GHANA

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Housing undoubtedly remains one of the essential needs of man among food and clothing from creation. Meeting this essential need has witnessed different interventions that span several centuries from individuals, community self help, corporate organisations, NGO's to governments. From the Palaeolithic era interventions have taken the forms of caves, make shift tents, nomadic artefacts, traditional mud houses, wooden houses etc. These efforts to meet the housing needs have been greatly influenced by nature of requirement, ethnicity, geographical location, colonial impact and national policy direction. In Ghana, the rate of housing delivery has been erratic and often fallen short of the demand. This has culminated into several developmental problems such as high unaffordable rent, development of slumps and ghettos and huge housing deficits that will take sustained efforts over long periods to correct. In Ghana, diverse efforts have been expounded by many key players before and after independence to provide this need of man. Until recently, housing provision was the responsibility of the government and few individuals who could afford. A critical analysis of the situation from pre independence to date posits interesting features- (1. In 2005, Ghana had an estimated 5.4 million slum dwellers, 2. Current statistics rate Ghana's housing deficit over one million as against an annual estimated delivery of 37,000 and 3. Besides less than 15% of the population can afford house ownership by mortgage and less than 8% without mortgage) -which give a solid background for future national policy direction on housing provision. Historically, housing provision in Ghana has evolved through several paradigm and fragmented unsustained interventions due to several factors. This paper presents a historical overview of housing provision in Ghana. It attempts to systematically bring to bare the challenges of housing delivery by reviewing past and present housing schemes and also collect the views of various key actors through semi-structured interviews

Keywords: Ghana, housing, mortgage.

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# HOUSE OWNERS' PARTICIPATION IN MASS HOUSING PROVISION IN NIGER STATE NIGERIA: A NEED FOR CHANGE FROM SPECULATIVE TO SPECIFIC HOUSING

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Urbanisation in Nigeria has brought about an increase in population and housing demand in the urban areas. In order to meet the demand for housing, State governments in Nigeria have adopted mass housing provision. The mass housing schemes adopted have and are speculative in nature. In Niger state Nigeria, mass housing provision between the years 2007-2010 has been through public private partnership. The houses built had the end-users involved at the sales stage of the process. The aim of the research is to show that the house owners in mass housing estates in Niger state would like to participate in the design of their future houses. In carrying out this research two housing estates were selected and a questionnaire was administered to selected households. The respondents were required to respond to questions with regards to what aspects of housing unit design they considered important participating in. An analysis of the data generated showed that majority of the house owners would like to have houses that meet their specific requirement. The research concludes that for any house to meet the requirements of each house owner there is a need for a conscious shift towards specific housing design in mass housing.

Keywords: design, house-owner, mass housing.

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# HOW SHOULD HEALTH AND SAFETY BE MEASURED AS A TENDER EVALUATION CRITERION IN THE GHANAIAN CONSTRUCTION INDUSTRY?

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Occupational health and safety is said to be relevant to all branches of industry, business and commerce including traditional industries, information technology companies, universities, leisure facilities and offices. Furthermore, construction methods, procurement systems and project management systems keep changing, making it imperative to place more emphasis on the management of health and safety issues. The parties bidding for the award of contracts must also demonstrate their competence in the area of health and safety management. This research investigated the current tender evaluation and contractor selection criteria in use in Ghana. Consideration was given to the evolution of the traditional time, cost and quality triangle into the time, cost, quality, and health and safety square. A model was therefore proposed for the assessment of the health and safety competence of contractors. The findings revealed that price is the major determining factor and that health and safety have not been considered in the criteria for contractor selection. However, the proposal for the adoption of the Golden Square received an enormous level of acceptance, with many of the respondents describing it as a brilliant idea and 'long overdue'.

Key words: health and safety, golden triangle, golden square, tender evaluation.

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# HYDROLOGICAL PERFORMANCE OF RAINWATER HARVESTING SYSTEM IN THE RESIDENTIAL SECTOR: A LITERATURE REVIEW OF MODELLING TECHNIQUES

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There is a growing interest in reducing water consumption and the associated water wastages in every sector of the economy. The residential sector is a substantial consumer of water in every country and therefore constitutes a focus of water consumption efforts. Since the water consumption characteristics of the residential sector are complex and inter-related, comprehensive models are needed to assess the environmental engineering and socio-economic impacts of adopting rainwater harvesting (RWH) as a sustainable system suitable for residential applications in developing countries. This research seeks to develop a RWH decision support system (DSS) to assist decision makers and stake holders by indicating the suitability of RWH in any selected part of developing nations in general and Nigeria in particular. A review of the various modelling techniques used for assessing the performance of RWH systems in the residential sector (i.e. in terms of their water saving reliability) is thus presented. Numerous approaches are identified: these range from the relatively simple, ‘rule-of-thumb’ approach to the more complex, statistical methods and sophisticated computer programs. The literature reviewed revealed, there are few RWHS models and there seems to be insufficient attention to Decision Support Tools (DST) for integrated urban water management. A GIS-based DST will be developed for evaluating rainwater by the combine use of RainCycle© model and mass balance-transfer model.

Keywords: modelling, rainwater system, water consumption, rainwater harvesting, residential sector.

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# IDENTIFICATION OF HEALTH AND SAFETY PERFORMANCE IMPROVEMENT MEASURING INDICATORS: A LITERATURE REVIEW

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Improvement to small and medium construction enterprises (SMEs) safety standards could inevitably be helped by continuous monitoring and review of their health and safety (H&S) performance. To achieve this objective safety performance improvement model is a prerequisite. Although various methods of health and safety performance improvement have been proposed, a more comprehensive health and safety performance improvement model is advocated which takes into account factors pertinent to SMEs projects. Studies have indicated there is no consensus of health and safety performance measuring indicators to be used in monitoring health and safety performance. This paper tries to fill this gap that is so contentious in the field of health and safety in the construction industry. An extensive literature review on health and safety literature identified 64 potential indicators that influence H&S performance, which may be incorporated in the health and safety SMEs questionnaire survey, after the Delphi survey. The measuring, indicators identified were leading indicators, categorized in 10 core elements depicting the health and safety culture characteristic i.e. management commitment, employees involvement and occupational health and safety management system i.e. what the organization does. These core elements and leading indicators will also depict the health and safety management of an organization.

Keywords: health and safety, literature review, measuring indicator, performance improvement.

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# IMPACT OF IMPROPER SOLID WASTE DISPOSAL ON URBAN HOUSING IN AKURE, NIGERIA

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Solid wastes are solid or semisolid materials resulting from human and animal activities that are useless, unwanted, or hazardous. Poor consciousness of the inhabitants on the environment and inadequate information on hazards that can result from wastes has also contributed to disease breakouts and deterioration of the built environment. This paper seeks to assess the significance of the dangers posed by indiscriminate disposal of solid waste on the built environment by examining its impacts on the inhabitants of the building structures with particular reference to selected neighbourhoods in Akure, Ondo State, Nigeria. The study summarizes and interprets findings from empirical survey of some residential buildings randomly selected within the study area through the use of questionnaire, direct observations, housing demographic and facility survey to elicit relevant data relating to social, economic and environmental variables. Data obtained were collated and presented in the single factor descriptive analysis while health records were obtained from the few available health institutions. Findings show that health of individuals cannot be considered in isolation without considering the building and the environment in which they live. The paper recommends public enlightenment, environmental and health education, enforcement of environmental and waste disposal protection laws and re-introduction of old sanitary inspectors with corresponding policy statements.

Keywords: building structure, solid waste, urban housing.

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# INDUSTRIAL TRAINING IN GHANA: PERCEPTIONS OF THE UNDERGRADUATE CONSTRUCTION STUDENT

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The recent oil discovery and processing in Ghana is expected to result in growth of infrastructural development and increased chances of construction graduates to secure jobs. Universities hold the responsibility of producing graduates with sufficient background and excellent qualification to meet the expectations of the construction industry. Although universities' curricula have provisions for industrial training (IT), such programmes have not made the expected impact and need quick redress. This paper assesses the perceptions of undergraduate construction students of the College of Architecture and Planning of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana, on IT, and identifies challenges and possible measures to overcome such challenges. A structured questionnaire survey of 185 final year Building Technology and Architecture students was conducted. Data obtained were analyzed based on mean scores of factors evaluated and also t-test to assess the significance of the differences between students' performance before and after undertaking IT. Students are of the view that IT exposes them to real work environment and increase their job prospects among others. Students' satisfaction level with their performance on personal attitude, communication and work attitude significantly improved after undergoing IT. They are, however, not satisfied with their departments' involvement, particularly, with regards to placement and monitoring. Stressful placement processes and financial strain on students are some of the challenges identified. Educational institutions are to collaborate with industry to secure suitable placement for all students and to monitor IT activities in order to enhance the effectiveness of training programmes.

Keywords: construction undergraduate, Ghana, industrial training.

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# INFLUENCE OF CHANNELS OF RECRUITMENT ON PERFORMANCE OF CONSTRUCTION WORKERS IN NIGERIA

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The productivity of construction workers which has been discovered to be a major problem and the possible contribution of the channel adopted for recruiting workers to it necessitates the adoption of appropriate channel of recruitment. This study investigates the use and influence of existing channels of recruitment on workers performance in the Nigerian construction industry. The objectives are to evaluate the extents of use of selected channels of recruitment and their influence on construction workers' length of service and performance. A field survey of 532 construction workers selected from construction companies in Nigeria by purposive sampling was conducted. For the field survey, 10 channels of recruitment were selected and data were collected on respondents' characteristics, the channels adopted for recruiting the respondents and the immediate supervisors' assessment of their performance. The data were collected using structured questionnaires and analysed using percentage, mean item score and chi-square test. The study discovers that some channels adopted in recruiting construction workers are more used than others however; their use does not contribute to the length of service and performance of construction workers. The study suggests that construction firms should neglect the possible length of time that prospective workers will serve them and their performance but rather consider the convenience, cost, possibility of reaching prospective applicants and other related factors in choosing the channel to adopt in recruiting their prospective workers.

Keywords: employee recruitment, Nigeria, workers' characteristics, workers' length of service, workers' performance

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# INFLUENCE OF CONSTRUCTION SITE OHS FACILITIES ON OHS PERFORMANCE IN NIGERIA

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As part of the effort to improve the poor Occupational Health and Safety (OHS) condition of the Nigerian construction industry, this study investigates the OHS condition of construction sites in Nigeria. In the study, construction site OHS condition is defined by OHS facilities provided. The objectives are to evaluate contractors' perception of the adequacy of selected OHS facilities and its influence on OHS performance on construction sites. To achieve the objectives, a questionnaire survey approach involving a field survey of 86 construction projects selected by stratified random sampling was adopted. Data were collected from the heads of the project sites on the adequacy of 12 selected facilities required on construction sites, the characteristics and number of construction workers employed, accidents and injuries recorded on sites in 2008 using structured questionnaires and analysed using Relative Provision Index (RPI) and chi-square test. The results indicate that contractors perceive the adequacy of OHS facilities provided on sites to be moderate and their adequacy has significant influence on OHS performance. It is concluded that the OHS facilities provided on project sites contribute to improvement in OHS performance. It is suggested that construction firms should commit adequate resources and effort to the provision of OHS facilities on their project sites and put in place appropriate provisions in their OHS policy and structures that will ensure adequate provision of the facilities.

Keywords: construction site, contractor, Nigeria, OHS performance, OHS facility.

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# INFLUENCE OF IT USE AT PRE-CONTRACT STAGE OF CONSTRUCTION PROJECTS IN AKWA IBOM STATE NIGERIA

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The growth of the construction industry is increasingly predicated on technology driven investments in Information Technology (IT). This study evaluates the extent of use of IT at pre-contract stage of construction projects in Akwa Ibom State. The objectives are to determine the factors that affect the use of IT at pre-contract stage, the extent of use of IT at pre-contract stage of construction projects and its influence on project performance. A questionnaire survey design approach involving a field survey of a sample of forty projects was conducted. Data were collected from project leaders of the projects sampled using structured questionnaires and analysed with Mean Item Score and Chi Square. The results indicate that high cost of IT hardware and software, lack of management commitment, low level of computer literacy of project leaders and size of firm rank high in effect on the use of IT. It also reveals that the extent of use of IT at pre-contract stage does not contribute to project performance. Greater use of IT at pre-contract stage is suggested as a tool for improving project performance while local production of IT hardware and software, greater management commitment and computer training programmes are suggested as measures of increasing the extent of use of IT at pre-contract stage.

Keywords: information technology, Nigeria, pre-contract stage, project performance.

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# INNOVATIVE APPROACHES TO SUSTAINABLE BUILT ENVIRONMENTS IN NIGERIA

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Sustainability as far as the environment is concerned, is not new. It is seen as a means of reducing environmental degradation, enhancing environmental protection, and environmental costs (such as energy consumption). Sustainability concepts also encompass the basic principles of having a healthy lifestyle. This work reviews the concept of sustainability as it relates to buildings and the built environment by examining the basic principles and indicators of sustainable buildings, with a view to determining innovative approaches to attaining sustainability in buildings in Nigeria.

Keywords: innovative approach, Nigeria, sustainable buildings, sustainability.

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# INVESTIGATING THE PERCEPTIONS OF ARCHITECTS IN THE GHANAIAN BUILDING INDUSTRY WITH REGARD TO PHOTOVOLTAIC ENERGY TECHNOLOGY

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Photovoltaic energy conversion is widely considered one of the promising renewable energy technologies with the potential to contribute significantly to a sustainable energy supply and which may help to mitigate green house emissions. However the availability of physical and technical potential of the technology does not guarantee adoption. Rather a number of factors including how the technology and its attributes are perceived by potential adopters influence the adoption decision. This study therefore investigates the perceptions of photovoltaics by architects in the Ghanaian building industry. It involved a survey of architects within the Ghana Institution of Architects. Results of the study showed a generally positive perception regarding photovoltaics except with a number of items such as initial cost of the technology. The few negative perceptions may however account for the low levels of actual photovoltaic adoption in the Ghanaian building industry.

Keywords: energy, Ghana, innovation diffusion, photovoltaic.

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# INVESTIGATION INTO THE USE OF TOTAL QUALITY MANAGEMENT IN NIGERIAN CONSTRUCTION INDUSTRY: A CASE STUDY OF LARGE AND MEDIUM SIZE FIRMS

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Previous researches indicate that Total Quality Management (TQM) has been in use since the 1980s. In Nigeria, studies have shown little usage of TQM despite its potential benefits to the industry. This study therefore aims at investigating the use of TQM in Nigerian construction industry. The study was carried out using structured questionnaire to collect data from stake holders in the construction industry. The data were analysed and the mean and standard deviations were determined and formed the basis for discussion. The results indicate that most contracting organisations in Nigeria are yet to fully adopt TQM in their operations. The findings suggests that principal factors which prevent contracting organisations from adopting TQM is the perception that it takes a long time to yield the desired benefits, and that TQM involves unnecessary extra cost. It was recommended that government being the major client of the construction industry should come up with an award for excellence for quality construction to deserving organisations and a penalty for organisations which refuse to adopt TQM. This will serve as an incentive for conformity to standards in various areas of the industry and deterrent to defaulters.

Keywords: Total Quality Management, Nigeria.

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Chindo, P.G. and Adogbo, K.J. (2011) Investigation into the use of total quality management in Nigerian construction industry: A case study of large and medium size firms *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 683-690.*

# **JOS PLATEAU VOLCANIC DEPOSITS AS SUSTAINABLE CEMENTITIOUS MATERIALS FOR PARTIAL REPLACEMENT OF PORTLAND CEMENT IN CONCRETE MIXTURES**

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The costs of concrete mixtures are high in Nigeria. This is due to soaring prices of Portland cement (PC) in the country. There is a need therefore to reduce the PC contents in the concrete mixtures by its partial replacements with Sustainable Cementitious Materials of volcanogenic origins (natural pozzolanas). These materials are environment friendly (no CO<sub>2</sub> emissions) and are economical as little or no energy inputs are required prior to their applications. The compressive strengths tests of concretes with 15% partial replacements of the PC with the pozzolan indicated that the Portland Pozzolana Cement concrete mixtures gave Pozzolanic Activity Index varying from 90 to 99%. The Moisture Contents of 90 % of the samples tested were 0.10 to 2.30% by weight. It is thus, concluded that the Jos Plateau volcanic deposits possessed Pozzolanic Characteristics and are thus potential cementitious materials for partial replacements of the PC in concrete mixtures.

Key words: Jos, natural pozzolanas, partial replacements, pozzolanic activity, sustainable cementitious material.

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# LEADER INFLUENCES ON TRAINING EFFECTIVENESS OF CONSTRUCTION PROFESSIONALS: THE CASE OF NIGERIA

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Training can be defined as the systematic acquisition of skills, concepts or attributes that result in improved performance in another environment. Training effectiveness is a function of trainee characteristics, training design and contextual factors. The purpose of this study is to examine the extent to which leaders influence skill transfer, maintenance and generalisation. Using a survey research, 160 construction professionals that have attended continuous professional development (CPD) programmes of their respective professional bodies were asked to respond to the structured questionnaires. The data generated were subjected to both inferential and descriptive statistics. The findings in this study indicates that LMX, training motivation and outcome expectancy are positively related to training effectiveness. The practical contributions of this study are twofold: The first has to do with leadership. The professional who has a good relationship with his or supervisor stands a much better chance of benefitting from the training. Secondly, Leaders can directly influence their employees' training motivation and this has a positive impact on how they transfer new skills, maintain them over time and how they use them in other domains of their jobs.

Keywords: construction professionals, leadership, Nigeria, training.

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# MALAIKA CHILDREN'S VILLAGE, MKURANGA, TANZANIA: A CASE STUDY OF SUSTAINABLE CONSTRUCTION IN AFRICA

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Sustainable construction should not be seen as something that is exclusive to expensive projects, as it has the potential to be applied to any development. Even switching of small aspects of a development to more sustainable materials or designs is a step forward. Malaika Children's village, Mkuranga, in Tanzania represents a case study of effective sustainable practices by planning, design, construction, and maintenance as well as theme formation and concept. The village is a Hydraform sustainable construction demonstration, designed in 2008 to accommodate 320 AIDS orphans and offer them a normal life with a unique living concept based on family houses. It is an excellent example of current sustainable construction practice that showcases the problem as well as the solutions employed. In highlighting the case of sustainable construction with this very successful project - still in progress - this paper offers tangible evidence of the construction industry's adoption of more sustainable practices in Africa for more provocative cost efficient results!

Keywords: compressed earth blocks, efficient water system, phased construction, sustainable construction, Tanzania.

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# MANAGEMENT OF BUILDING CONSTRUCTION DISPUTES IN NIGERIA

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The relationships between the stakeholders in most building construction end up in disputes. Efforts have been made over the years to avoid or improve on the management of dispute without much success. The aim of this study is to identify the most preferred dispute resolution method in the area of study. This study adopted descriptive survey research and the focus is on medium and large construction firms in Lagos state. The respondents for the study were (architects, builders, quantity surveyors, civil engineers, project managers, mechanical and electrical engineers). Data collected was mainly primary data with some elements of information obtained from secondary data through literature review. The random sampling technique was used to select the respondents for the study. The data collected were analysed using descriptive and inferential statistics. The result of data analysis indicates that the most preferred method is arbitration, this closely followed by negotiation, conciliation. There is need to popularise these methods through Seminars, workshops and conferences by various stakeholders involved in the administration of building projects.

Keywords: dispute resolution, Nigeria.

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Onukwube, H. (2011) Management of building construction disputes in Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 725-734.*

# MANAGING THE ADVERSE HEALTH AND SAFETY INFLUENCE OF SUBCONTRACTING: FINDINGS OF A QUALITATIVE INQUIRY

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Despite the economic benefits of subcontracting, it is widely known to be one of the factors influencing adverse health and safety (H&S) outcomes on projects. Given the increasing complexity of construction technologies which inevitably means that specialisation in construction will grow, it is expected that there will be even more subcontracting in the future, and hence the need for measures to address the adverse H&S influence of subcontracting. In the UK, beyond the legal health and safety requirements which offer some opportunity for mitigating the H&S impact of subcontracting, there is limited insight as to how main contractors manage this adverse impact in terms of their in-house H&S practices. Using semi-structured interviews with key management personnel of 6 UK contractors, the research question, “*how do main contractors manage the adverse H&S influence of subcontracting, in terms of their in-house H&S practices?*” was investigated. The inquiry revealed that beyond the legal requirements, two strategic measures adopted by the investigated contractors are: restricting the layers/tiers of subcontracting on projects; and having a regular chain of subcontractors. These measures are aimed at addressing the communication, teamwork, competence, and safety culture issues that are associated with workforce fragmentation introduced by subcontracting. Given that the adverse H&S influence of subcontracting is an international phenomenon, these findings provide a learning opportunity for all construction contractors within and outside UK, particularly the large and medium contractors who often sublet work packages.

Keywords: health and safety, interview, procurement, subcontracting.

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# MERGING ARCHITECTURAL AND SCULPTURAL FORMS IN THE BUILDING INDUSTRY

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Long before time sculpture, painting and architecture were treated as inter related area, and was evidential in the books that were published before the 1960's on these areas of study. Over the years, however, authors and practitioners of these disciplines have tried frantically to separate this seriously interrelated subject matter by not involving each other in practice, in trying to do so have negatively affected the buildings that are put up. Most architects are refusing to see their creations as art pieces, and or should incorporate art works. Some in their desperate quest in satisfying their cliental demands refuse to see artist near their creations, as is perceived as that the artist work will distort their design. This paper seeks to establish the relationship between sculptural and architectural forms as bed fellow. In so doing comparative analysis will be made of architectural forms with sculptural forms incorporated in it and those with no sculptural forms included. Also, this will bring to bare the importance of consulting with sculptors before designing, in the design process, and finally in the execution stages of the architectural forms. The above, are classical examples of sculptural and architectural forms merged. The fusion concept are rendered in Fiber glass, Cement, Auto body filler, Terracotta and other materials based on cliental demands. The merger which most has termed "Archisculpture" should be sustained by both professionals to create aesthetics in our homes, employment, and psychologically therapeutic, ease tension and accommodate human kind with our creations.

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Micah, V.K.B. and Ankra, O. (2011) Merging architectural and sculptural forms in the building industry *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 745-745.*

# MINING ACTIVITIES IN NIGERIA URBAN ENVIRONMENT: IMPETUS FOR COMMUNITY DEVELOPMENT OR ENVIRONMENTAL DETERIORATION?

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Mining as part of human activities on land is an expanding industry that can provide sustainable economic, environmental and social benefits to communities and regions where it is taking place. Nonetheless, the extraction process often times have adverse effects on their immediate physical environment. This paper examines residents' perception of the effects of mining activities on their environment. Data needs were collected through the administration of structured questionnaires in a systematic random manner on 10% (554 respondents) of the households in Ijero Local Government Area of Ekiti State, Nigeria. A total of 21 variables were analysed to determine the Resident Tolerance Index (RTI) value for residents on each of the variables. The study reveals that the RTI was found to be between 'not tolerable' and 'not at all tolerable'. The paper further noted that only three variables such as 'high influx of people', 'increase in sales and services', and 'improved economic condition' with RTI values above 3.0(just tolerable) were the accrued benefits to the residents while the remaining 17 variables with RTI values of less than 3.0 were considered to have adverse effects on the environment. In conclusion, the paper recommended that government should ensure that mining activities are controlled by enforcing appropriate legislations on the miners and at the same time provide adequate infrastructural facilities like potable water and electricity to enhance economic development in the area and ensure a sustainable community development.

Keywords: environmental degradation, residents, socio-economic, sustainable development.

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Adeyinka *et al.* (2011) Mining activities in Nigeria urban environment: Impetus for community development or environmental deterioration? *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 747-760.*

# **ON THE ACCURACY OF COST ESTIMATES: IDENTIFYING FLAWS IN BILLS OF QUANTITIES FOR BUILDING PROJECTS IN NIGERIA**

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Previous researches indicate that accurate cost estimates play significant roles in construction project decisions. The accurate cost estimates by quantity surveyors are crucial elements in the success of construction project processes. However, the reliability of bills of quantities as forms of cost estimates has been questioned by researchers. This study therefore aims at identifying flaws in the preparation of accurate cost estimates in bills of quantities prepared in Nigeria. The study was carried out by the use of a document analysis approach to analyse bills of quantities for seventeen building projects. The results indicate that there is the presence of inaccuracies inherent in bills of quantities for building projects in Nigeria. The findings suggest that accurate cost estimates in the Nigerian construction industry will ensure the survival of business and individuals in the industry. It was recommended that consultant quantity surveyors should explore and use computers to aid them in using various estimating techniques at their disposal for better service delivery.

Keywords: accuracy, bills of quantities, building project, cost estimate, Nigeria.

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Musa, H., Ibrahim, Y.M. and Ibrahim, A.D. (2011) On the accuracy of cost estimates: Identifying flaws in bills of quantities for building projects in Nigeria *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 761-766.*

# **PARTNERING: AN ALTERNATIVE CONTRACTUAL ARRANGEMENT FOR CONSTRUCTION PROJECT DELIVERY IN GHANA**

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Understandably, clients in both the public and the private sectors in Ghanaian construction industry have become increasingly dissatisfied. What they see is unpredictability and under-performance. What they receive is too often of poor quality, late and over priced. More often contractors enter the construction project focusing on achieving their objectives and maximising their profit margins, with no regard for the impacts on others. This mindset leads to conflict, litigation and often a disastrous project. In the pursuit of performance excellence, there is a need for partnering. This paper therefore, attempting to explain the need for partnering as an alternative approach to construction project delivery. The paper presents a review of partnering projects in general. Through a postal and e-mailed questionnaire survey, opinions of various parties in Ghanaian construction industry – clients, sub-contractor and contactors were sought regarding construction project delivery and level of use of partnering. This paper also explains the importance and benefits arising from partnering implementation as reviewed by the other researchers and concluded that, partnering is one of the most innovative developments in delivering a project efficiently and reducing disputes. It provides a sound basis for a 'win – win' climate and synergistic teamwork. By changing to a 'win – win' style the parties can reap benefits of cost saving, profit sharing, quality enhancement and time management.

Keywords: client, under-performance, partnering, win-win.

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Ansah, S.K.. (2011) Partnering: an alternative contractual arrangement for construction project delivery in Ghana *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana,771-781.*

# PERFORMANCE OF BUILDING PROJECTS FUNDED BY PUBLIC ORGANIZATIONS: POTENTIALLY INFLUENCING MANAGEMENT PRACTICES

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There is a strong association between project performance and project management practices. Satisfactory performance is a reflection of optimal practices. Management practices may however differ from organization to organization. The aim of this research is to determine whether there are differences in the performance of building projects funded by selected public organizations. The study was pursued in two stages: (1) determination of the performance of projects managed by the organizations and (2) identifying potential project management practices that could explain differences in the performance of the projects. Building projects of three funding organizations were selected for the Study. A structured questionnaire was used to collect information for measuring the performance of projects executed from year 2005 to 2009. Pair-wise analysis was used to test for differences between the performances of projects using independent t-test. Significant differences were observed in the time and cost performances of projects managed by the different organizations. Semi-structured interviews were conducted for identification of practices used in the management of the building projects. The time and quality performances of one organization was better than the other two organizations. This organization's practice of establishing a budget for particular project and making payments from that budget at defined stages could explain the differences in the performances.

Keywords: Ghana, project finance, project management practice, project performance, public organization.

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# POST OCCUPANCY EVALUATION OF PUBLIC OFFICE BUILDINGS IN MINNA URBAN: A CASE STUDY OF SOME SELECTED GOVERNMENT PROPRIETIES

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Since humans spend more than 90% of their lives inside constructed environments and reasonable percentage of their active time in productive activities in such environments like offices, it is fundamental to know how office environments support workers productivity and how best they are satisfied with these environments. Post Occupancy Evaluation therefore has long been recognised as a method of measuring the performance of a building in use as well as provide information for upgrading or improving existing facilities. It is against this background that the research examines post occupancy evaluation of public buildings in Minna, Nigeria. The primary method of data collection was an extensive questionnaire combined with physical observation of office environments. The research reveals that there is no significant relationship between quality of office environment and workers productivity. Notwithstanding, there is need for the involvement of workers at design decisions that affect their offices for there to be an enabling environment and perfect job satisfaction by workers.

Keywords: office environment, post occupancy evaluation, workers' productivity.

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# **PUBLIC PRIVATE PARTNERSHIP (PPP) IN HOUSING DELIVERY IN NIGER STATE: CASE FOR LOW AND MEDIUM INCOME EARNERS**

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The problem of providing adequate and qualitative housing for Nigerians, especially the low and medium income groups has been the concern of both the government [public housing developers] and many individuals [private developers] since independence. However, not until recent times, when the world attention is drawn to the practicability of a symbiotic relationship between government policies, plans and programmes and private pragmatic project implementation approach that the PPP became a topical issue. Government of Niger State through its agencies, Niger State Housing Corporation, Niger State Ministry of Housing and Environment etc. has in the past provided houses for the civil servants and general public, but not in sufficient quantities. The paper examines how the low and middle income civil servants fare in the provision of PPP housing in Minna, Niger state capital. A total of three hundred (300) questionnaires were administered to workers of different grade levels in the Federal, State, Local government ministries and parastatals, including police and para-military agencies in Minna. Data obtained were analysed using relative frequency distributions. The result reveals that PPP could be a viable method of mass housing delivery, with modification for peculiarities of the low and middle income earners and that primary mortgage institutions are yet to perform their expected role of providing housing loans to the majority of the civil servants in the state.

Keywords: developer, housing, mortgage, Public Private Partnership, Nigeria.

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# **PUBLIC-PRIVATE PARTICIPATION IN HOUSING IN NIGERIA AND THE CASE FOR COMMUNITY PARTICIPATION**

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Collaboration between the public and private sector towards mass delivery of low-income housing is a relatively new policy initiative in Nigeria. This initiative of partnership has been widely embraced and employed in a number of housing schemes across the country in the recent past. Three of such schemes which represented partnership between state government and private developer and the federal government and private developer were chosen as case studies. They are, Sunshine Gardens and HOB Estate, both in Akure and the Doma road Estate in Lafia. The absence of community/beneficiaries' participation in the schemes was discovered from the study. This absence impinged on the overall performance of these shelter projects. A case was therefore made for community/beneficiaries' participation throughout the stages of the public-private partnership for low-income housing. The advantages of this third partner should be exploited to improve success on the present and future housing schemes.

Keywords: community participation, housing, public-private partnership.

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# REGENERATION OF BIOPHILIC ARCHITECTURAL CONCEPTS AND PSYCHOSOCIAL VALUES IN BUILDING DESIGN

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On reflecting on the various settings and experiences of our lives today, we should be able to find some fairly close matches between characteristics we like that would have improved our chances of survival. In our course we perceive that the natural contiguous keeps us healthy and in turn probably promotes physical performance as well. Occupants of built environment do not want to work, play, eat or sleep in a functional building. They want to be inspired, invigorated, comforted and reassured by their surroundings. We want spaces that will make them more appropriate and comfortable. In sum buildings that celebrate the local microclimate, topology, vegetation, hydrology and material resource. Biophilic Architecture offers an exciting opportunity to achieve environmental, moral and economic benefits. It is an investigation into nature based designs that merge the interior with the exterior; a natural blend between landscape architecture and interior design. Green architecture - an ecostyle that identifies with the characteristic manner of nature referred to as biophilia. It is an investigation into the psycho-evolutionary framework of the origin of shelter. Why is it that some environments heal us while others do not? Conclusively, it will involve breaking up the nature of architectural design of the workspace involving identification of key elements that increase optimal productivity of the occupants of our buildings. The ultimately resulting is a more effective built environment that has both physiological and psychological impact, determining that the design of human communities affect human health and productivity.

Keywords: biophilia, green architecture, therapeutic garden, living building, psychosocial.

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# REINVENTING PROTOTYPE BUILDINGS: THE SIGNIFICANCE OF PREFABRICATION IN MASS HOUSING CONSTRUCTION

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Increasingly, high quality housing remains a problem of the housing industry. Compared to the feat recorded by electronic and automotive industries, most prototype mass housing generally reveal a great deal of variability in the end products. which differs greatly from the original model. The variability is manifested in building components such as walls, floors and finishes, which compromise both quality and uniformity. Prefabrication is considered as a better approach to the production of mass housing. .A number of visits was made to mass housing construction sites in Minna, capital of Niger State, Nigeria to assess discrepancies of work in the prototype buildings. A model prefab system was highlighted and other applications of innovative methods and techniques especially at the Massachusetts Institute of Technology (MIT) House\_n Research Consortium on open source buildings were discussed. The approach can engender high quality construction, increase standardisation of repetitive work and reduce time spent on construction.

Keywords: mass housing, prefabrication, prototype, quality.

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Lawal, L.A.T. (2011) Reinventing prototype buildings: The significance of prefabrication in mass housing construction *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 819-825.*

# REMITTANCES TO GHANA: BENEFITS TO THE HOUSING SECTOR AND IMPACT OF FINANCIAL CRISIS

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The role of inflow of overseas remittances towards the development of housing sector in Ghana, and the impact of recent financial crisis on the development process is investigated. This is achieved through a review and analysis of information gathered through national and international statistical sources and targeted household and institutional interviews. As a prelude to the analysis the study assessed the importance of remittance as large and growing part of the economic underpinning of developing countries. It then assesses whether remittances have a particular relationship with housing. The research provided an estimate of the nature, level and uses of remittances and the different cyclical characters of other flows. It reveals that the successful real estate market development across Ghana during the past decade benefited from a buoyant national economy, improved financial systems and family remittances. However, the picture changed especially during 2008 attributed mainly to the global financial crisis and economic downturn. The reverberating problems of unemployment and high levels of bankruptcies in the advanced countries were felt but not as pronounced as they were in the major industrialised economies. The discussions concluded by posing a much broader question in relation to other developing countries about how remittances could be mobilised towards the development of the housing sector.

Key words: financial crisis, Ghana, housing sector, migrant remittance.

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Karley, N.K. (2011) Remittances to Ghana: Benefits to the housing sector and impact of financial crisis  
*In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 827-840.*

# REVITALIZATION OF NIGERIAN URBAN CENTRES THROUGH EFFECTIVE USE OF OPEN PUBLIC SPACES: A CASE STUDY OF ONITSHA METROPOLIS

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Urban centres in Nigeria have largely experienced congestion due to the pressure of urban expansion, consequent upon uncontrolled population increase and growth. Urban Public spaces as part of urban structure and function constitute areas of physical, social and cultural interaction among urban dwellers. Open public spaces could be natural, communal or designated through government planning and policies. They exist as nodes of connectivity, spaciousness, balance and aesthetics in urban areas. Proper functioning of these spaces should be emphasized in the planning and realization of development schemes in urban areas. This would enhance the revitalization of existing urban centres and create a sense of order and efficiency within the urban fabric. Field work studies have been carried out on open public spaces in Onitsha and presented in this research. This paper examines the case of Onitsha and makes suggestions on revitalization of urban centres through proper utilization of these open public spaces.

Keywords: open public space, Onitsha, urban centre.

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Okolo, N., Okpala, C., Ezeji, K. and Okolie, A. (2011) Revitalization of Nigerian urban centres through effective use of open public spaces: a case study of Onitsha metropolis *In: Laryea, S., Leiringer, R. and Hughes, W. (Eds) Procs West Africa Built Environment Research (WABER) Conference, 19-21 July 2011, Accra, Ghana, 841-841.*

# SECURITY MEASURES ADOPTED BY ESTATE SURVEYORS SHOPPING MALLS IN KADUNA, NIGERIA

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Agency surveyors have not been able to address the importance of security in shopping malls, as it affects life of customers, tenants and the shopping mall in developing countries. The provision of or availability of security guards in shopping mall attracts shoppers and visitors (window shoppers). This study focuses on the security measures put in place by estate surveyors in shopping malls. Five shopping malls were selected for the study based on their location, size and shoppers patronage, using a combination of semi-structured questionnaire and personal interviews targeted at the tenants and managing surveyors. Data was collected on the number of guards, measures adopted, equipments being used, size of the shops, rental values, previous security breach, fire incidence if any. Simple descriptive statistics were used in analyzing the data. The results show that the number of security guards and the work hours varies in the shopping malls, the measures adopted were reasonable however the equipment use were not in consonance with global trends also the number of security provided was not based on the size of the shopping malls and the number of shoppers, which contrasts to previous findings. The outcome of this research can help investors and security agencies curb security breach in shopping malls.

Keywords: agency surveyor, security, shoppers, shopping mall, tenant.

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# SOURCES OF DEFICIENT INFORMATION REGIME IN URBAN REAL ESTATE MARKETS IN SUB-SAHARAN AFRICAN COUNTRIES

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Generally, land registration systems of developed countries produce sufficient and reliable real estate market information compared to that of developing countries including Sub-Saharan African countries. The purpose of this paper therefore is to show, on the basis of critical review of focal literature, how the adoption of defective and inefficient approaches to land registration by land registries in Sub-Saharan Africa have undermined the supply of adequate and reliable urban real estate market information compared to their counterparts in developed countries. On the basis of a framework developed from land registration principles in literature, the paper systematically reviews literature to trace the sources of the deficient information regime in Sub-Saharan African land registries. The findings suggest that notwithstanding legal, social, political, and resource constraints and challenges in various countries, defective land registration approaches adopted and being used by most land registries are the primary sources of information asymmetry in Sub-Saharan African urban real estate markets. The findings of the paper have policy implications for land administrators, governments and their international development partners to adopt the appropriate policy approach otherwise, the colossal sums of money being pumped into current land administration reforms in Sub-Saharan Africa and other developing countries could go to waste. The paper brings to focus the problem of land information asymmetry and how the adoption of inappropriate and blunt land registration approaches have contributed to the deficient information regime in Sub-Saharan Africa real estate markets.

Keywords: information asymmetry, land registration, systematic registration, sporadic registration, real estate market, Sub-Saharan Africa.

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# SPATIAL SCALES AND MEASUREMENT OF HOUSING VALUES IN NIGERIA: THE CASE OF METROPOLITAN LAGOS

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This research paper tries to answer the questions that can heterogeneous zones be grouped to produce spatial markets? And are the submarkets produced meaningful geographically? The study shows that the use of small geographical scale helped to identify similar zones and neighbourhoods that have the same housing values and socio-economic characteristics. This is unlike some of the previous studies that combined wider areas together and so failed to identify spatial submarkets. Four different geographical scales were examined to determine the level of disaggregation of data, and the highest level of disaggregative data occurs where cities are divided into small areas by zones. This study utilized both secondary and primary sources of data. The study is based on data collected from sixteen Local Government Areas consisting of 53 residential zones in metropolitan Lagos. Out of the total number of 135,820 properties, a size of about 1% (1,500) was randomly selected. The hypothesis was tested using a combination of analysis of variance, multiple regression model, expansion method and the non hierarchical technique of grouping. The variations in house values by zones are more distinct than house values for communities and local governments that bear the same name. The grouping of the zones with similar house values also helps to identify housing submarkets that exist in the study area. The submarkets have variations in housing values that conform with the socio-economic characteristics of the households.

Keywords: housing value, Lagos, Nigeria

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# **SUSTAINABLE CONSTRUCTION IN NIGERIA: METHODS OF DELIVERING SUSTAINABLE CONSTRUCTION IN THE NIGERIAN CONSTRUCTION INDUSTRY**

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Various worldwide Summits have been held regarding sustainable development such as the United Nations Earth Summit held at Rio de Janeiro in 1992 which gave rise to the adoption of the Agenda 21 by governments, however, since the Rio de Janeiro Summit in June 1992, many countries have embarked on various environmental reform agenda to attain the sustainability mark. The issue of sustainable development is very challenging in developing countries especially when the priority concerns are poverty alleviation, institutional strengthening and socio-cultural issues to sustain harmony and peaceful co-existence. The purpose of this research was to determine the most suitable approach towards achieving Sustainable Construction in the Nigerian Construction industry as a developing country. After careful analysis of the problems at hand, with the use of questionnaires to survey the journey so far in sustainable construction in Nigeria, this document analyses various approaches towards achieving sustainable construction all of which cover key sustainability issues from waste management to noise reduction in construction processes.

Keywords: developing country, sustainable construction, Nigeria.

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# “SUSTAINABLE” OR “GREEN” CONSTRUCTION IN LAGOS, NIGERIA: PRINCIPLES, ATTRIBUTES AND FRAMEWORK

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The concept of sustainable development is used as a basis for enhancing understanding of sustainable construction. Principles of sustainable construction cover four attributes: social, economic, biophysical and technical. The research examined these concepts, principles and attributes in understanding sustainable and green construction as well as current practices and challenges of sustainable construction in Lagos, Nigeria. The research embraced both quantitative and qualitative methods of data collection. The sample frame is the total number of built industry registered and practising professionals in Lagos. A total number of 85 respondents were randomly selected for study from each group. A 5-point likert scale was used to assess respondents' judgement on the identified social, economic, bio-physical and technical indicators. Focus group discussions (FGDs) were also conducted with all the above professional groups to corroborate the primary information. For a wider coverage, three different construction sites are selected to reflect income neighbourhoods-Lekki (high income), Yaba (medium income) and Bariga (low income). Data Collected were analysed using the mean item score. A multi-stage framework which required the application of environmental assessment and environment management systems for construction projects was utilised. Research findings indicate that the most important factors considered for sustainable construction with their mean item scores are quality of working conditions (0.852) strengthening and enforcement of relevant law and regulations(0.872), encouraging construction waste management(0.819) and design for flexibility and adaptability. Results from the FGDs indicate that the current practice on sustainable construction does not take into consideration integrated design process, acoustic and visual comfort in the planning and construction of sustainable projects. The research, therefore, concludes that government should improve existing laws to enhance quality of working life, education, training as well as knowledge management for all stakeholders in sustainable construction.

Keywords: green construction, Nigeria, sustainable construction.

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# SUSTAINABLE TOURISM ARCHITECTURE: USER EVALUATION OF ARGUNGU FISHING VILLAGE

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Architectural design for sustainable tourism facilities demands the creation of spaces which will attract and satisfy the market, based on solutions which preserve, reinforce, or project destinations' natural and cultural attributes. In order to determine the extent to which this was reflected in the design of Argungu fishing village, Kebbi state, Nigeria, visual survey was conducted. This was followed by user perception survey through on-site questionnaires administration. Obtained data were subject to descriptive analysis and non-parametric tests. Findings from the questionnaire survey include: Perception of low level of response to the market; moderate level of response to local culture; and, high response to the natural environment. Results also show positive attitude towards the combination of indigenous and modern architecture in the design. The study concludes that the design of Argungu fishing village reflected considerable attempts at sustaining the natural and cultural environment. However, there is need for more attention to user needs and preferences in order to enhance patronage and economic sustainability.

Keywords: culture, fishing, market, natural environment, sustainable tourism.

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# THE CONTEXT OF HUMAN RESOURCE IN THE GHANAIAN PUBLIC SECTOR

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This paper examines the context of human resource management in the Ghanaian public sector to the effective management of employees in an organization in which they work. For one thing, such an understanding could provide managers with the opportunity to cater to the needs of their employees, for another, this could provide clues on which effective strategies towards the improvement of the work environment could be based. For a country such as Ghana where it is generally acknowledged that employee productivity is abysmally low, knowledge about the milieu in which employees work as well as factors influencing their behaviour, are certainly critical to effective human resource management.

Key words: employee, Ghana, human resource management, productivity, public sector.

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# THE LIKELY EFFECT OF SUSTAINABLE LANDSCAPE ON THE QUALITY OF LIFE THROUGH TOURISM: FOCUS ON NIGERIA

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Increase in leisure time, improved rising standard of living and concerns for healthy life style has geared people into taking part in tourism activities and landscape, play a very important role in the choice of the tourist destination. The desire of every tourist is to enjoy beautiful landscapes either natural or human-made which come in a variety of forms. A well landscaped attraction with nature, wildlife, water and other elements help people enjoy the environment, fresh air, engage in physical exercise, reduce anxiety and feel relaxed thereby adding to the quality of life. This paper sheds light on the need for proper development of tourist potentials in Nigeria through landscaping in order to improve on the quality of life of its people and tourists in general. It reviews literature in landscaping and examines the role it plays on the quality of life. It also analysed data collected from field survey in Nigeria using the descriptive summary measures and concludes that landscaping has the potential to contribute to the human wellbeing if considered, and should feature in the development of the Nigerian tourists' attractions.

Keywords: landscaping, Nigeria, quality of life, sustainability, tourism.

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# THE PROBLEM OF NON-COMPLETION OF INFRASTRUCTURE PROJECTS IN GHANA

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Many developing countries have identified the need to improve infrastructure as a key component in meeting their developmental needs. Projects are started with enthusiasm but often do not end in success being under funded, not completed or completed very late – or sometimes remain abandoned for many years. The aim of this study is to identify the causes of failure to satisfactorily delivery infrastructure projects in with particular focus on Ghana. The research concentrates on Ghana because, since showing commitment to parliamentary democracy in 1992, members of parliament and the District Assemblies have all targeted infrastructure provision but often without clear direction in coordinating and synchronizing developments leading to duplication of effort and a waste of resources. This paper includes an identification of practitioners' views regarding the constraints faced and major problems leading to incomplete infrastructure projects. These findings can be used to develop a model which together with effective project planning can be implemented successfully within the constraints faced by Ghana and to a large extent the other countries in West Africa.

Keywords: Ghana, health infrastructure, project non-completion, project planning.

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# THE THERMAL PERFORMANCE OF AN EDUCATIONAL OFFICE BUILDING IN GHANA

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The thermal performance of an educational office building which exhibits sustainable design principles of passive architecture (emphasis on the use of natural ventilation) was studied. The building has individual cell and open-plan office spaces with different orientation and ventilation possibilities (cross, one-sided and borrowed ventilation). Data loggers were installed to monitor the environmental conditions existing in the building during the rainy season. The evaluated data showed that the indoor temperatures were comfortable (mean of 25°C), the relative humidity values were mostly high (80 - 85%) and the dew point temperature (22°C) was found to be close to the recommended minimum comfort temperature. Moreover, the enclosed corridor space was found to be warmer than the adjacent office spaces during the day time. The use of cool night air as a passive cooling strategy is recommended. Preference for office types with ventilation possibilities could not be statistically recommended since all the evaluated thermal values showed insignificant deviations.

Keywords: environment, Ghana, natural ventilation, relative humidity, thermal performance.

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# URBAN LAND USE PLANNING IN GHANA: A POLICY INPUT DISCUSSION

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While the weakness of extant urban land use planning system in Ghana is not in doubt it is uncertain whether current planning reforms could address the fundamental issues that underpin the ailing planning system. This work as part of an ongoing study on evaluation of the economic justification of sub-Saharan Africa urban land use planning systems interrogates the planning regime in Ghana and the outlined reform package through a critique of the relevant literature. The primary aim is to provide input into current efforts in the country to devise effective and efficient urban land use planning model. The work establishes that while some of the causes of the problem such as high cost of compliance of planning regulations and inadequate knowledge of relevance of planning and its regulations appear obvious, their magnitude and conceptual explanations of the problem remain unresolved. To achieve a befitting planning model, conceptual understanding of the problem and knowledge of the magnitude of the causes such as planning regulation compliance cost are imperative. The work, therefore, outlines a conceptual explanation to the problem based on insights of the human action theory and identifies that the planning regime appears to lack incentives. Consequently, it is concluded that a quantitative cost and benefits of the extant planning regime is vital to the success of the planning reforms.

Keywords: Ghana, human action, urban land use planning system.

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# URBANISATION AND THE MARKETPLACE IN WEST AFRICAN COUNTRIES: IMPACT ON THE HEALTH AND SAFETY OF CHILDREN OF FEMALE TRADERS

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Female traders work in the informal sector, a large segment of the economy about which there is limited information. As such, their enormous contribution to the economy has yet to be fully recognized by economists, urban planners, and policymakers. As Urbanization continues, both the volume of demand and the number of female traders and street vendors are expected to grow. Economic reforms and downsizing in the public and private sectors over the years have driven many new entrants into this competitive market, affecting women greatly and causing downward pressure on earnings. Majority of these women have their children accompany them to the marketplace, exposing them to health and safety hazards. These pressures explain the need for women to be provided with facilities such as the on-site childcare centre which will assist them in taking care of their children on site while at work. The purpose of this research is to see how Urbanisation has affected the health and safety of children in the marketplace and ultimately the positive effect of introducing childcare facilities in marketplaces. It has actually been observed that public toilets have been the predominant features springing up in market places recently, but another important facility, salient and of major importance are the on-site childcare facilities.

Keywords: female traders, marketplace, on-site childcare facility, urbanisation.

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