ICES2019

INTERNATIONAL CONFERENCE OF ENVIRONMENTAL SCIENCES

COLLABORATION FOR SUSTAINABLE DEVELOPMENT IN THE BUILT ENVIRONMENT

Editors:
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Faculty of Environmental Sciences, University of Ilorin, Ilorin, Nigeria

ICES2019

INTERNATIONAL CONFERENCE OF ENVIRONMENTAL SCIENCES - 2019

COLLABORATION FOR SUSTAINABLE DEVELOPMENT IN THE BUILT ENVIRONMENT

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FOREWORD

It's my privilege and pleasure, on behalf of the Vice Chancellor of this great institution, Prof. Sulyman Agenjolola AbdulKareem, to welcome you all here today. It has been a long journey since the idea of the first ***International Conference of Environmental Sciences*** (ICES) was muted. It looks then that we cannot do it, what with many other problems we have to cope with as a very young Faculty.

Being the very first academic outing of our fledging faculty, we are all aware that it cannot be our best effort. We just needed to start somewhere, hoping that in subsequent years, as we develop capacity, we will continue to build on gains of today. So feel free to tell us areas we can improve upon because in years to come, the goal is to make ICES a flagship biennial national dialogue.

The encouragement for the university administration, particularly our Leader and Vice Chancellor, Prof Abdulkareem and the doggedness of faculty staff and students have made today a reality. I therefore want to appreciate our Vice-Chancellor and my colleagues in the faculty for making today possible. .

The goal of sustainable development is to meet the needs of today, without compromising the needs of tomorrow. This implies that we cannot continue using current levels of resources as this will not leave enough for future generations. Therefore, stabilising and reducing carbon emissions is key to living within environmental limits as this will create a truly sustainable built environment that is fit for the future.

The theme, ***Collaboration for Sustainable Development in the Built Environment***, captures our focus as academia and professional in the larger society and the broaden Sustainable Development Goals (SDGs). Beyond that, it gives exciting opportunities to several of our professionals like Quantity Surveyors, Architects, Geologists, Geo informatics, Town Planners, Land Surveyors, Estate Valuers, Engineers etc to express themselves and their activities at ICES.

Collaboration is essential for development in today's world because real life challenges require researches that are multidisciplinary in nature. When you want to control flooding for instance, you need Civil Engineers, Soil Scientists, Geographers, Geologists, even Public Relations Professionals etc for diverse roles.

For robust development of built environment in a sustainable ways, **geographers**, who are concerned with the study of places and relationships between people and their environments; **Surveying and Geo-Informatics Professionals** who are concerned with geo-data and geo-information about locations in relation to the earth and **Urban and Regional Planners** who will develop and design use of land are essential partners.

Furthermore, **Architects** helps with planning, designing, and construction of buildings and any other structures that made up the environment while based on the structural performance of different materials and geometries the **Structural Engineers** design the 'bones and muscles' that create the form and shape of the structures designed by the Architect. **Services Engineers** strive to achieve a safe and comfortable indoor environment whilst minimizing the **environmental impact** of buildings through collaboration with **Chemical Engineers** and other specialists. Then **the Quantity Surveyors,** who are the construction cost experts, will predict and manage construction cost from inception to completion.

So evidently, we must all collaborate to make possible the attainment of Sustainable Development Goals (SDGs). And as if to emphasize the need for collaboration, the drafters of the Seventeen (17) Sustainable Development Goals made goal Seventeenth, perhaps the ultimate goal- partnership for all the previous 16 goals. Besides, the University authorities here have always emphasize multidisciplinary collaboration among researchers.

We are honoured to have Prof. Adeniyi Suleiman Gbadegesin, our Keynote speaker, in our midst this morning. He is a colossus and mentor to many professors of Geography. As an international scholar of repute with wide and varied experience, this gathering will benefit immensely from his paper.

Similarly, we have with us Prof. Ahmad Doko Ibrahim of the Department of Quantity Surveying and Project Construction Management, Ahmadu Bello University (ABU) Zaria who had done a lot to bring ABU into reckoning. I salute you sir and welcome you heartily.

The 1st International Conference of Environmental Sciences (ICES 2019) received a total of 150 abstract, accepted 72 and today we have a total of 49 full papers to be presented by authors in 6 parallel sessions. Students' competition on the theme of the conference will be conducted to conclude the activities of the conference.

Let me express the warm appreciation of staff and students of this faculty and the entire university to all our professional colleagues who are gracing this occasion in the spirit of town and gown mandate.

"It's therefore my pleasure to extend a cheerful welcome to you all! Your presence makes us very happy."

Thank you for coming

Dr. Ganiyu Amuda-Yusuf
Ag. Dean Faculty of Environmental Sciences

ACKNOWLEDGEMENTS

The First International Conference of Environmental Sciences (ICES 2019) organized by the Faculty of Environmental Sciences, University of Ilorin, Nigeria owes its success to the hard work, commitment and support of individuals both in the academia and the general public. These individuals provided the technical, financial and logistic supports that enable the Faculty realize the objectives of this epoch making academic event.

First, the Local Organizing Committee (LOC) sincerely appreciates the Vice Chancellor of University of Ilorin – Professor Sulyman Age Abdulkareem, who provided huge moral and logistic support for the Faculty to make the conference possible. We are grateful to the Vice Chancellor and the entire University Management for providing accommodation and transport logistics for the Guest Speakers and for the general smooth running of the conference. This singular support demonstrates the commitment of the Vice Chancellor and his Management team to academic excellence which enhances the visibility of University of Ilorin both nationally and internationally.

The LOC is grateful for the dynamic leadership of the Acting Dean of the Faculty of Environmental Sciences – Dr. Ganiyu Amuda-Yusuf, whose vision and relentless efforts saw to the conception, planning and execution of this conference. Your support and encouragement have, in no small measure, assisted in the realization of the objectives of this conference. The support of the Acting Dean of Faculty of Communication and Information Sciences (CIS) – Dr. Jimoh R.G. at the conceptual and implementation stages of the conference is quite commendable. His inputs help crystallize the conference concept notes while the provision of venues for the technical and plenary sessions addressed our logistic needs. We are also grateful to the Dean, Students Affairs – Prof. L.T Ajibade who assisted the LOC in the review of conference papers and in the mobilization of the Students for the conference.

The keynote speakers at this international conference delivered thought provoking papers that served as the conference ice breaker and they have made us proud. We are grateful to Prof. Adeniyi Gbadegeshin, the immediate past Vice Chancellor of Ladoke Akintola University (LAUTECH), Oghomosho and Prof. Ahmad Doko Ibrahim of Ahmadu Bello University for accepting our invitation and for delivering the lead papers for the conference.

We recognize the contributions of Dr. Bolaji Sulieman, the Sub-dean of the Faculty of Environmental Sciences who coordinated conference planning and execution activities on behalf of the Faculty. The secretariat operations of the conference were adequately handled by the Faculty Officer –Mrs. Azeezat Ibrahim. The LOC is grateful to her and other administrative staff of the Faculty for their immense contributions.

At the preparatory stage of this conference, the Faculty reached out to individuals and corporate organizations for financial support. In response, many donated substantial amounts of money which assisted a lot in procuring materials for the conference. The Faculty appreciates the well-meaning individuals and management of all corporate organizations for this kind gesture.

This conference could not have been a success without the dedication and untiring efforts of the LOC and other sub-committees that handled the conference planning and implementation. On behalf of the LOC, I sincerely thank **all those** who served in the LOC and all other sub-committees. I am specifically grateful to the Chairmen of all sub-committees in person of Dr. N.A Bello (Technical Sub- committee); Dr. Maimuna O. Abdulraheem (Logistic Sub-committee); Dr. A.I Bako (Publicity and Linkage Committee) and Mr. Ahmadu Hussein (Student Competition Sub-committee).

Worthy of singular mention and appreciation is a member of the LOC - Mr Rasheed Abdulkadir Shehu who was a wonderful and reliable partner in progress. His calm and confident deportment to all knotty issues coming from any of the sub-committees translated in several ways to the accomplishment of this conference

The list of contributors to the success of this conference is almost endless. We are grateful to all Heads of Department and academic staff in the Faculty of Environmental Sciences who assisted in one way or the other to make the conference a resounding success. We hold all our paper reviewers, plenary chairpersons and rapporteurs in high esteem and thank them for their selfless services. Finally, I thank all the non-teaching staff and students of the Faculty for their roles. May God reward you all for your contributions.

Dr. Maimuna O. Abdulraheem
Chairperson, Local Organizing Committee

CONFERENCE CENTRAL ORGANISING COMMITTEE

Dr. Maimuna O. Abdulraheem - Department of Urban & Regina Planning – Conference Chair
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Dr. R.G. Jimoh - Ag. Dean of Faculty of Communication & Information Studies, University of Ilorin, Ilorin - Nigeria

Paper Review Panel

Prof. A.A. Adedeji – Department of Civil Engineering, University of Ilorin.
Prof. L.T. Ajibade – Department of Geography, University of Ilorin
Prof. V. A. Bello - Department of Estate Management, Federal University of Technology, Akure- Nigeria
Prof. N.B. Tanimowo – Department of Urban and Regional Planning, LAUTECH
Prof. A.D. Ibrahim- Department of Quantity Surveying, Ahmadu Bello University, Zaria
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Dr. O. O. Olanrele - Department of Estate Management, University of Malaya, Malaysia - Nigeria
Dr. I. E. Wallace - School of Architecture, Victoria University of Wellington, New Zealand
Dr. Ayo Babalola - Department of Surveying & Geo-Informatics, University of Ilorin, Ilorin - Nigeria

Peer Review Process

The papers submitted to this conference were subjected to a rigorous peer review process which involved an initial review of abstract. A total of 150 abstracts were reviewed and 72 accepted. Afterwards, the authors of accepted abstracts were provided with the reviewers' comments and were advised to proceed to full paper submission, incorporating all suggested amendments in the reviewed abstracts.
Blind reviews of full manuscripts by minimum of two reviewers were carried out on the submitted manuscripts. A total of 72 full papers were received and the reviewer's comments were then sent to the authors of accepted papers with the request that they should address all of the issues raised by the reviewers. Tracked changes made by reviewers on authors' original papers were also sent to authors to help with revising their papers. A compliance check of authors returned corrected papers was further done to ensure that all the reviewer's comments were followed.
During the review process, members of the paper review panel, editors and conference organisers were not involved with the review of any paper they authored or co-authored.
A total of 52 papers of all authors who have demonstrated sufficient evidence that all reviewers' comments had been addressed were accepted into the conference proceedings.

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CONFERENCE PROGRAMME

DAY 1 MONDAY 29TH APRIL, 2019

PROGRAMME FOR THE OPENING SESSION

8:00 am - 9:30 am	**Registration**
	Venue: University Main Auditorium
9:30 am - 9:40 am	**National Anthem & Unilorin Anthem / Introduction of Guest**
9:40 am - 9:50 am	**Opening Remarks by the Conference Chair.**
	Dr. Maimuna O. Abdulraheem, Chairperson, Organizing Committee
9:50 am - 10:00 am	**Welcome Address by the Host.**
	Dr. Ganiyu Amuda - Yusuf -Ag. Dean Faculty of Environmental Sciences
10:00 am - 10:20 am	**Vice Chancellors Address.**
	Prof. Sulyman Age Abdulkareem - Vice Chancellor University of Ilorin
10:20 am - 11:00 am	**Keynote Adress 1.**
	Prof. Adeniyi Gbadegesin - Professor of Geography, Immediate Past Vice- Chancellor, LAUTECH, Ogbomoso.
11:00 am - 11:40 am	**Keynote Address 2**
	Prof. Ahmad Doko Ibrahim - Professor of Quantity Surveying, Ahmadu Bello University, Zaria.
11:40 am - 12:00 pm	**Questions/Contributions/Responses**
12:00 pm - 12:10 pm	**Address by the Special Guest of Honour**
	Arc. M. J Faworaja. (MICIArb, MFIMS, FNIA, PPNIA) MD/CEO ARCHCON NIG. LTD
12:10 pm - 12:30 pm	**Launching of the Maiden Edition of Faculty of Environmental Sciences Journal** - *(Journal of Environmental Spectrum)*
12:30 pm - 12:40 pm	**Goodwill Messages**
12:40 pm - 12:50 pm	**Closing Remarks**
	Prof. N. B Tanimoowo - Pioneer Dean, Faculty of Environmental Sciences
12:50 pm - 1:00 pm	**Vote of Thanks**
	Dr. N.A Bello - Conference Secretary

DAY 1 MONDAY 29TH APRIL, 2019

PROGRAMME FOR THE TECHNICAL SESSIONS

1:00 pm - 1:30 pm	**Tea Break/Snacks/Small Chops**

PRE-CONFERENCE WORKSHOP *Venue: University Main Auditorium*

RESEARCH CLINIC	**Chairperson:** *Prof. Titilayo A. Alabi*
1:30 pm - 2:10 pm	**Research Lecture:**

Prof. Ahmad Doko Ibrahim - Professor of Quantity Surveying,

Ahmadu Bello University Zaria.

2:10 pm - 2:30 pm **Questions & Answers**

2:30 pm - 3:00 pm **Lunch Break**

FIRST PARALLEL SESSION

FIRST PARALLEL SESSION DAY 1 - MONDAY 29TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

3:00 pm - 5:00 pm

GROUP 1	**GROUP 2**
INFORMATION TECHNOLOGY ADOPTION IN CONSTRUCTION	**REMOTE SENSING & DIGITAL INFORMATION SYSTEMS**
CHAIRPERSON: Dr. Saudat S. Baki	CHAIRMAN: Prof. J.F Olorunfemi
RAPPORTEUR: Dr. N. A Musa	RAPPORTEUR: Dr. Ayo Babalola
Paper 1:	**Paper 1:**
Bim Adoption Challenges in Malaysia: Expert Opinion.	Assessment of Users' Satisfaction on Manual & Digital Land Information System in Kwara State, Nigeria
Badiru, Y. Y.; R.B Tukur.; and Abdulazeez, A.D	*Adekoya, A. A., and Bello. M. O.*
Paper 2:	**Paper 2:**
Sustainable Architectural Practices in Nigeria: Benefits of Adopting Building Information Modeling	Spatio-Temporal Analysis of Bida Housing Market Using Geographic Information System
Elimisiemon, Monday Chris	*Mohammed, J. K. & Sulyman, A. O.*
Paper 3:	**Paper 3:**
Factors Affecting Human Resource Management in Small Construction Firms in Lagos Metropolis, Nigeria	Establishment of Deformation & Subsidence Monitoring Baseline in the Coastal Environment: A Case Study of University of Lagos
Oluwaseyi Modupe Ajayi; Oluwasegun Emmanuel Akinsiku & Tajudeen Olufemi Salami	*Alademomi Alfred Sunday, Mayaki Anthony Omeiza, Daramola Olagoke Emmanuel & Salami Tosin Julius*
Paper 4:	**Paper 4:**
Influence of Web-based Project Management System on Project Delivery	Design and Implementation of Sustainable Built Environment: The Role of Surveying & Geo-Informatics towards Effective Collaboration with Other Professionals
A.S. Rasheed & R. T Adebiyi	

		Ahmadu, H. A., Babalola, A. and Salami, B. I.
	Paper 5: Assessment of Readiness of Nigerian Construction Firms on Adoption of Lean Construction Principles *M.L Aisha & A.M. kasimu*	**Paper 5:** GIS as a Tool for Sustainable Development in Public Secondary School Mapping *Ipadeola A. O., Abdulyekeen A.O., Olatunde G.*
	Paper 6: Perceptions of Career Development among Women in Nigeria Construction Industry *Adebiyi Ranti Taibat, Amuda-Yusuf Ganiyu, Rasheed Abdulkadir Shehu, Idris Soliu & Ola-Ade Esther Oluwafolakemi*	**Paper 6:** A Review of Intelligent Transportation System: Adaptive Management *Busayo Adebiyi, Risikat Folashade Adebiyi, Ahmed Tijani Salawudeen & Abubakar Umar*
	Paper 7: Effect of implementation of E-Procurement on Corrupt Practices in Nigerian Construction Industry *Odulana, A. O. & Oyewobi, L. O.*	
5:00 pm - 5:10 pm	**CLOSING**	

DAY 2 TUESDAY 30TH APRIL, 2019

SECOND PARALLEL SESSION

SECOND PARALLEL SESSION DAY 2 - TUESDAY 29TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

	GROUP 1	**GROUP 2**
8:30 am - 10:30 am	**ARCHITECTURE & HOUSING DEVELOPMENT MANAGEMENT**	**CONSTRUCTION ECONOMICS & COST MANAGEMENT**
	CHAIRPERSON: Dr. Nasmat T. Surajudeen-Bakinde RAPPORTEUR: Dr. A.I. Bako	CHAIRMAN: Prof. A.M Junaid RAPPORTEUR: Dr. Ranti T. Adebiyi
	Paper 1:	**Paper 1:**

Assessment of Crowd Control Strategies in the Design of National Stadia at Abuja and Uyo, Nigeria

Naimu M. S & Abdulrahman M. E

Paper 2:

Retrofitting Prospects for Daylight Enhancement in 'Dark' Corridors of an Institutional Prototype Building

O. M. Idowu, A. A. Umar, S. Humphrey & A. U. Attah

Paper 3:

Assessment of Landscape Design Elements Application for Crowd Movement Optimization in Catholic Churches in Benue State, Nigeria

David Lubem Angitso & Chukwudum J. Eze

Paper 4:

The Challenges of Placemaking of Leisure & Recreation Parks Development in Nigeria

Abdulwahab Engworo Etudaiye, Abdullahi Sadauki, Yusuf Saliu & Ibrahim Yusuf Baba

Paper 5:

Critical Assessment of Fire Safety Measures in Shopping Malls, Abuja, Nigeria

Audu Francis Eleojo & M.E Abdulrahman

Paper 6:

Hardened Property of Blended Cement Mortar for Sustainable Housing Construction

Oyejobi, D. O., Adelabu, J. K., & Abdullahi, K. O.

Paper 7:

Influence of Risk Factors on Redevelopment Projects: A Case Study of Yankari Resort & Safari Project, Bauchi State

Aminu Muhammad Bashir

Paper 2:

Risk Management Strategy in Public Private Partnership on Housing Development. A Case of Niger State

Yatsu U.M and Kasimu M.A

Paper 3:

Risk Factors Affecting Cost and Time Performance of Civil Engineering Projects in Kwara State

Idris Soliu, Awodele., O. A & Amuda-Yusuf., G

Paper 4:

Appraisal of the Causes of Ineffectiveness of Skilled Tradesmen in Building Construction Industry in Lagos State

Olanrewaju, Rauf A., Adebiyi, Ranti T. & Fasasi, Abdulwaheed

Paper 5:

Drivers and Barriers to the Implementation of Green Building Development

Onososen, Adetayo Olugbenga & Osanyin Oladipupo

Paper 6:

Appraisal of Causes and Effects of Delayed Payment on Building Construction Projects Delivery in Niger State

M. N. Amina; J. E. Idiake & A. M. Kasimu

Paper 7:

	Assessment of Aspect Ratio & Configuration Effects in Corporate Office Buildings Courtyard, in Abuja, Nigeria *Ofiedane J.M & Eze J. C*	Evaluating Methods of Training of Mason for Productivity Improvement in Nigeria Construction Industry *Suleiman, Ayinde Elelu & John, Ebohimen Idiake*
	Paper 8: Architectural Design Considerations to Enhance Security in Mixed-Use Building, Lagos, Nigeria *Ogunbayo, R. A & Akande, O. K*	
10:30 am - 11:00 am	**TEA BREAK**	

THIRD PARALLEL SESSION

THIRD PARALLEL SESSION DAY 2 - TUESDAY 30TH APRIL, 2019

VENUE: FACULTY OF COMMUNICATION AND INFORMATION SCIENCES [CIS]

	GROUP 1	**GROUP 2**
	URBAN/ENVIRONMENTAL MANAGEMENT & PLANNING	**REAL ESTATE DEVELOPMENT AND PROPERTY MANAGEMENT**
	CHAIRMAN: Prof. A.M Junaid	CHAIRMAN: Prof. B.T Aluko
	RAPPORTEUR: Dr. A.B Ola	RAPPORTEUR: Dr. Ranti T. Adebiyi
11:00 am - 1:00 pm	**Paper 1:** Multidimensional Approach to Flood Vulnerability Assessment in Coastal Communities of Suleja and Tafa LGA, Niger State *Abdulhakeem Salau Bello and Muhammad Ahmed Emigilati*	**Paper 1:** The Impact of Emotional Intelligence on the Performance of Consultant Estate Surveyors and Valuers in Nigeria *Akinwamide, David Oluwatofunmi*
	Paper 2: An Assessment of Streetscape Infrastructure in Ilorin Metropolis, Nigeria *Abdulraheem M. O., Suleiman A. R. Alao R. O. Alimi R. K. Alade A. K & Garba I.O.*	**Paper 2:** Emerging Barriers to Efficient Urban Land Acquisition Process for Real Estate and Facilities Development in Nigeria *Kazeem .B. Akinbola; Taofik .I. Salau,; Nurudeen .A. Bello.*

Paper 3:

Assessment of Spatial Changes in Coastal Ecosystem at Amuwo-Odofin, Lagos Nigeria

Alfred Sunday Alademomi, Tosin Julius Salami, Olagoke Emmanuel Daramola, Elias Adediran, & Joseph Olayemi Odumosu

Paper 3:

Challenges of Accessing Affordable Housing by Low-Income Civil Servants in Abuja, Nigeria

Olayinka Ezekiel Ajayi & Oyekunle Luqman Oyewobi

Paper 4:

The Practice and Challenges of Biomedical Waste Management: A Study of Selected Medical Facilities in Ile-Ife, Osun State

Ola, A. B.; Bako, A. I.; Abdulraheem, M. O.; Raheem, W. M.; Raheem, W. A. & Adewale, Y. Y.

Paper 4:

Collaborative Working Relationship among Nigerian Built Environment Professionals: Factors and Benefits

Nurudeen Akinsola Bello, Kazeem Bolayemi Akinbola, Rasheed Olamide Alao, Sulaiman Adetoye Adepoju & Sulaiman Adesoji Olabisi

Paper 5:

Understanding Vulnerability and Resilience of Ilorin Central Area, Ilorin, Kwara State

A.I. Bako, O. T. B. Aduloju, A. R. Suleiman, & F. O. Lawal

Paper 5:

Conventional Approaches and Mechanism to Housing Market Analysis

Mohammed, J. K. & Sulyman, A. O.

Paper 6:

Effect of Informal Activities on Urban Road Network Infrastructure in Minna, Niger State

Adeogun, A. S., Idowu, O. O., Olabisi S.A, & Iroh E.

Paper 6:

Challenges and Opportunities of Resolving Land Use Conflicts through Mediation in Nigeria

Uwaezuoke, Ngozi Ifeanyi & Owolabi, Kayode Michael

Paper 7:

Gully Erosion: Vulnerability and Impact on the Resident of Agulu-Nanka

Nwokocha Oluchi and Musa Dalil

Paper 7:

User Satisfaction of Social Housing in Kaduna Metropolis

Julius Andrew Baji, Jonah Binga, Deborah Babarinsa, Mercy Richard Auta, Yakubu Ahmed Ubangari, & David Ayock Ishaya

Paper 8:

Paper 8:

	Evaluation of Petrol Filling Stations Against Established Standards in Ilorin Metropolis. *Tanimowo, N. B., Raheem, W. M., Owolabi, O. Q.., Raheem, M. O.. Salawu, G. O. and Onundi Lawal, F. O.*	Effect of Public Budgeting on Neighbourhood Quality and Rental Values in Ilorin *W.A Durosinmi, M.T.A Ajayi, M.B Wahab, W.O Shittu & A.O Hassan.*
	Paper 9: Child Poverty Mapping: Towards Effective Child Poverty Reduction *Akande Sheerifdeen Olaide, Mohammed Ndana & Aremu Reuben*	**Paper 9:** Evaluation of the Contribution of Real Estate-based Revenue to IGR of Kwara State. *Agava, Halim Yusuf; Adedotun, Ife Adeshola & Gombwer, Nenrot Wuyokwe*
1:00 pm - 2:00 pm	**STUDENT COMPETITION PRESENTATION**	
2:00 pm - 3:00 pm	**LUNCH**	
3:00 pm - 4:00 pm	**CONFERENCE COMMUNIQUE**	
	CERTIFICATES & CLOSING	
	DEPARTURE	

CONVENTIONAL APPROACHES AND MECHANISM TO HOUSING MARKET ANALYSIS

Mohammed, J. K. and Sulyman, A. O.
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Abstract.
Housing market mechanism and conventional approaches to housing market analysis depends on different scenarios. Therefore, this paper review previous literature on housing market analysis in order to establish factors that determines housing prices in different scenarios. Hence, a total of 60 published academic journals, conference papers, thesis and others obtained through secondary sources were reviewed. It was found out that structural attributes, environmental/neighbourhood factors, urban form, location, socioeconomic characteristics, national economic performance (micro and macro) and policy were major determinants of housing prices. It was also found out that little has been done on urban form in relation to housing price determinant. It therefore concluded that hedonic model was the most used conventional approach to housing market analysis, particularly regarding structural attributes and environmental/neighbourhood attributes, while Artificial Neural Network is given less preference. These form basis for further researches on housing market.
Keyword: *Conventional approaches, Housing market, Housing price, Mechanism, Modelling*

1.0 Introduction

As early as 13th and 14th century, Ibn Taymiyyah (1962) and Ibn Khaldun (1958) had explained the determinants of rent which is rarely found in the contemporary housing market literature. Indeed the central role of housing market to the national economy due to its direct impact and contribution to the Gross Domestic Product (GDP) essentially made its study worthwhile (Seo, 2008; Hu, Cheng, Wang & Xu, 2013).

Housing is a special kind of commodity that cannot be moved from place to place (Renigier-Biłozor, Biłozor & Wisniewski, 2017). Consequently, the location of the house is of utmost importance, since, basically, this feature cannot be changed (Cichociński & Dąbrowski, 2013). The importance of housing to the broader economy has also been demonstrated by the global financial crisis of 2007–2011, which began in the U.S. housing market. Although, there are several factors that determines housing prices (Xiao, 2017). It is essential that governments, central banks and market participants are well informed of trends in house prices (Hill & Scholz, 2017).

The degree to which internal and external factors affect house prices is not unique, but highly variable over space. There are indeterminable number of factors (internal and external) which inflate the given location (Wang et al., 2017; Tupenaite, Kanapeckiene, & Naimaviciene, 2017; Liu & Li, 2018). The issue of changing house prices is important. For example, if there is an increase in asset values (creates positive equity), it can lead to housing equity withdrawal and rising confidence. Instead, falling house prices reduce the equity and may create negative equity, especially for new homeowners, which creates negative consumer sentiment and is likely to lead to lower household spending. Changes in house prices also affect the distribution

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of wealth in the economy. During times of rapidly rising prices, those who own property will experience an increase in their wealth relative to those who rent accommodation (Zmölnig, Tomintz, & Fotheringham, 2015).

It is therefore imperative to further review empirical literature on housing market. The purpose of this study is to review empirical literature on housing price determinants and conventional approaches to housing market analysis in order to examine better approaches adopted in analysing various housing market determinants in the previous researches and to illuminate gap in the literature that would form basis for housing market modelling using conventional approaches and further research in housing market.

2.0 Literature Review

Housing market is an organised meeting place where there are buyers and sellers of housing goods and services, and are demanded and supplied (Sulyman, 2015). There exists a large body of literature on housing market. For example, Leung (2004) examined housing–Macroeconomic nexus issues pertaining to housing taxation, housing cycles, and housing market–urban structural form. Wu, Deng, & Liu (2014) developed house price index for nascent housing market. Yang, Hu, Li, Zhang, & Torres (2017) assess spatiotemporal effects of main impact factors on residential land price in major cities of China. Cheung, Wetherell, & Whitaker (2018) examined the impact of earthquakes on residential property values using sales data from Oklahoma from 2006 to 2014. Wang, Wang, & Wang (2018) focused on the effect og land prices on the spatial differentiation of housing prices. Xiao (2012) studied urban morphology and housing market with emphasis on street network pattern as a fundamental determinant of house prices since street network pattern influences accessibility. In the same vein, Wang, Wang and Wang (2018) analyse the spatial patterns and driving forces of housing prices in China where multiple theoretical perspectives on housing demand, supply and market, are combined to establish a housing price model to explore the impact of land prices on housing prices.

Price in the housing market is determined by many factors, ranging from structural attributes of the house (Debrezion, Pels, & Rietveld, 2006; Wu et al., 2014a); environmental/neighbourhood factors (Antoniucci & Marella, 2017a; Liu & Li, 2018); urban forms (Xiao, 2012; Xiao, Orford, & Webster, 2016) and external factors such as the national economic performance (Gulyani, Talukdar, & Bassett, 2018; Killins, Egly, & Escobari, 2017). This has attracted a large body of literature on various determinants of price in the housing market (Alkali, Sipan, & Razali, 2018).

3.0 Materials and Methods

This study adopted an archival research methodology where it focuses basically on review of empirical literatures on housing price mechanism and conventional approaches to housing market analysis. A total of 60 recent empirical research works were presented in tabular form descriptively (see Appendix). The methodology employed in collecting the required data was based on secondary sources obtained from academic journals, conference papers, thesis and textbooks from both printed and online sources.

4.0 Data Analysis and Research Findings

Findings of this study reveals that determinants of housing prices are based on structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy or policy (see Appendix).

4.1 Structural Attributes as Determinants of Housing Prices

Numerous researches have been conducted on the relationship between structural attributes and housing price. For instance Archer et al. (2010) examined the influence of structural attributes on housing price using spatial variation method. The study found out that housing characteristics offer decidedly the strongest power in explaining the segmentation which gives explanation of housing price. Another study by Ajayi et al. (2015) assesses the relationship

between housing condition and rental value. The study adopted spatial approach where it found out that building condition has weak relationship with rental values. Gulyani et al. (2018) examined the relationship between living conditions and housing value. The study adopted hedonic model in analysing its data. It found out that relative value of housing features with electricity, kitchen and number of rooms emerging as important drivers of rent. It was also found out by Abdullahi, Usman, & Ibrahim (2018) who use multiple regression analysis that type of house, availability of swimming pool, availability of security post, type of door and location of the property were significant in determining house price. Bolton (2018) also used hedonic model to find out that green-certified houses that are third-party verified will carry a higher price premium than green-certified houses without this verification.

Iliopoulou & Stratakis (2018) conducted spatial analysis of housing prices in Athens region of Greece where Geographically Weighted Regression method was adopted and found out that structural attributes contribute immensely to the housing price determination. Also, in another separate studies by Lu (2018) and Saenko, Kushina, & Pukhova (2018) considered building orientation (in China) and depreciation (in Russia) to have positive relationship with housing price. Lu (2018) adopted hedonic model while Saenko, Kushina, & Pukhova (2018) used correlation-regression analysis. Another study from China by Cui, Gu, Shen, & Feng (2018) suggest that houses with large numbers of rooms commands higher rental value using spatial approach, hedonic price model and quantile regression model.

4.2 Environmental/Neighbourhood Attributes as Determinants of Housing Prices

The study found out from previous empirical studies that pollution, gas risk, flood hazard, neighbourhood facilities, conflicts, vices, crime among others have negative relationship with housing price. A study by Yusuf & Resosudarmo (2009) uses hedonic model to establish relationship between air pollutant and housing rental price. Their study found out that in the cases of lead, total hydro carbon (THC), and SO2, air pollutants have a negative association with property value. Bin et al. (2008), Jung & Yoon (2018) and Razali et al. (2018) observed that location within a flood zone lowers property value. The study also employed hedonic model. Muehlenbachs et al. (2015) found out using hedonic model that Shale gas development has large negative impacts nearby ground water which has negative effect on the housing value. Aliyu (2012) observed that there exists relationship between intangible location attributes and provision, availability and maintenance of neighbourhood facilities in the study area with the rental value. The study employed regression analysis. It was also observed by Chen & Li (2017) using 3-D spatial hedonic model, that homebuyers would like to pay an extra premium for an apartment located farther away from polluted streams.

Wu et al. (2017) and Xiao, Li, & Webster (2016) found out, using hedonic model, that the effect of parks on the housing price is statistically significant. Gambo (2012) uses hedonic model to observe that conflict-free area is the most influential variable determining rent. Kemiki, Ojetunde, & Ayoola (2014) also use hedonic model to establish that rental value tend to decrease with decreasing distance to Lafarge cement factory due to severity of dust and noise. Using Machine Learning Methods Aderibigbe & Chi (2018) observed that housing price is impacted by natural disasters factors such as hurricane. Paz & McGreal (2018) adopted Price index and Hedonic model to establish that improvements in neighbourhood quality affect house price. These improvements also include converting the abandoned railway into a greenway as observed by Noh (2019).

4.3 Location as Determinants of Housing Prices

Previous studies have shown that proximity to major employment centre, transit network, schools, parks and hospitals, major landmarks, major junctions and city centre among others, determines housing price at a given location. For instance, Wickramaarachchi (2016) and Oluwadamilola (2017) use multiple regression model to find out that distance to main junction

is the most significant variable in the types of properties. Liang et al. (2018) uses regression analysis and geographic field model to analyse the effects of locational factors on the housing prices of residential communities. The study found out that proximity to externalities of parks, lakes, department stores, banks, secondary schools and rail transit have significance but spatially non-stationary effects on housing prices. This is also confirmed by Li et al. (2018) and Kim et al. (2019) using hedonic model. However, in line with monocentric model of Alonso (1964), D'Acci (2018) found out that housing value decreases with increasing distance from the city centre.

4.4 Socioeconomic Characteristics as Determinants of Housing Prices

Socioeconomic characteristics have been given much attention as determinant of housing price. For example, a study conducted in Singapore by Li & Tang (2018) using dynamic general equilibrium model and counter-factual experiments suggests that the native population growth can generate more of private housing price than growth of the foreign population. Oluwadamilola (2017) in his study using multivariate regression found out that income have significant effect on rental value of accommodation. Using search-and-matching model, Gan et al. (2018) confirm unemployment influences on the housing market. Flage (2018) adopted meta-analysis method to found out that ethnic and gender discrimination have impact rental housing market. In South Korea, Kim & Lee (2018) use locally weighted non-parametric regression to found out that housing market respond to potential crime risk. In terms of fertility rate and housing price, Zhao (2018) uses cross weight coefficient and regression models to found out obvious positive correlation between housing price and fertility rate.

4.5 Urban Form as Determinants of Housing Prices

The impact of urban form on housing price has attracted many researches in recent decades. For instance, Xiao, Webster, & Orford (2016) examine house price effects of changes in urban street configuration using spatial-network analysis. They found out that improved accessibility leads to higher property prices. In contrast, a study by Devaux, Berthold, & Dubé (2018) suggest that reorganization of the street had no significant impact on the closest properties' prices, but had negative effects for properties located within 150 to 450 meters off the street. However, Xiao (2012) investigate relationship between urban morphology and housing market using space syntax method. The study captured two cities; Cardiff in UK and Nanjing in China where the results show that urban morphology have a statistically significant impact on housing price in these two distinctly different housing markets.

4.6 National Economy (Micro and Macro) as Determinants of Housing Prices

Scholars have considered national economic performance indicators in terms of both micro and macroeconomics to be determinants of housing market. For example, Killins et al. (2017) studied the impact of oil shocks on the housing market of USA and Canada. Their study use structural vector autoregressive model and found out that reaction of housing markets to oil price shocks varies significantly depending on whether the change in oil prices is prompted by demand or supply shocks in the oil market and on country oil trading status. Similar study was conducted by Cameron (2018) using local projection method and found out that house price in regions respond heterogeneously to oil price shocks. In another perspective, Antoniucci & Marella (2017b), Ge (2017) and White & Papastamos (2018) uses multivariate regression, agent–based model and LSDVC model respectively to found out that economic recession and financial crises have significant impact on housing price. Chen (2018) assess spatial heterogeneity of housing price in Guangdong Province during 1995-2014 and the spatial heterogeneity of its impact factors using Geographical Weighted Regression (GWR). The study found out that GDP per capita have impact on housing prices. In terms of inflation rate and interest rate, Than-Thi, Dong, & Chen (2019) use autoregressive model to found out that the

inflation rate has a negative impact on the U.S. housing market in an economic downturn (including the global financial crisis), but no strong relationship for the other periods, while interest rates have a reverse influence on the U.K. housing market in a recession only and are insignificant in other periods.

4.7 Policy as Determinants of Housing Prices

Government policies such as development control, energy control, urban renewal policy, tax, tenure security, government intervention on rent, housing supply policy, economic policy and bank credit have been considered as housing market determinants in the literature. For instance, Zhang & Zhao (2018) use ordinary least squares and multi-level hedonic models to found out that a higher tenure security increases the housing price. Zhou (2018) using Principal component and lagged sentiment proxies suggest that government interventions have impact on housing market. Similar result was recorded by Chung, Seo, & Kim (2018) using spatial approach and Hedonic Model. In a study by Huang, Lin, & Ning (2018) using regression model suggest that housing market is prosperous when economic policy is stable and there is a positive relationship between housing price variation and economic policy uncertainty, which means housing market risk grows under unstable economic policies. Bérard & Trannoy (2018) using month-based model and hedonic model found out that increase in the real estate transfer tax sizable have short-term effect – but no medium or long-run effect on the housing price. In another perspective, He, Cai, & Hamori (2018) studied relationship between housing prices and bank credit using vector autoregression (VAR) model with stochastic volatility found out that all kinds of bank credit influences of housing prices.

5.0 Discussion of Findings

From empirical studies, various determinants of housing prices in different scenarios have been established. These determinants include structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy and policy.

Findings from various researches revealed that variables under structural attributes as housing price determinant includes housing type, building materials (type of roof etc.), obsolescence, age of building, building condition, building facilities (electricity, toilet, water, dining, size of rooms, type and size of doors and windows, security etc.), building orientation, green certified housing. For environmental/neighbourhood attributes as housing price determinant, the variables include pollution (water, air, noise and land), flood risk, gas development risk, parks, neighbourhood facilities (sewage, street light, road, drainage, public water, energy etc), conflict, vices, crime, densities, green space and greenway. natural disaster (hurricane, tsunami, typhoon, etc.), spatial growth rate and environmental quality. Variables for location as determinant of price include proximity to major employment centre, proximity to transit network, proximity to schools, parks and hospitals, proximity to major landmarks, proximity to major junctions and proximity to city centre.

Findings from various studies also revealed that variables for socioeconomic characteristics as determinant of housing price include household size, income, marriage entry, discrimination, native and tribe, household unemployment, crime offenders, fertility rate, gender and ethnic discrimination. Variables for urban form as determinant of housing price include street pattern, land use pattern and density. National economy as determinant of housing price have land value, market spillovers, oil price, exchange rate, GDP, economic recession, financial crises, speculation, disposable income rate and inflation rate as variables. For policy as determinant of housing price, the variables are; development control, energy control, urban renewal policy, tax, tenure security, government intervention on rent, housing supply policy, economic policy and bank credit.

These determinants have been approached with difference method, which include; hedonic model, hazard model, spatial variation, logit model, matched pair audits, spatial approach, space syntax, dynamic general equilibrium model, counter-factual experiments, structural vector autoregressive model, multivariate regression, agent–based model, analytic hierarchy process, local projection method, exploratory data analysis, geographical weighted regression, search-and-matching model, ordinary least squares, spatial-network analysis, meta-analysis, cluster analysis and causality test, month-based model, price index, random-intercept multilevel model and mahalanobis-metric matching model. Hedonic

model is the most used method from the findings, which is seen to be the better method in terms of structural attributes as determinant of housing price. These methods were applied to housing price analysis but little among the researches combined spatial and non-spatial method of analysis.

6.0 Conclusion

In conclusion, determinants of housing price include structural attributes, environmental/neighbourhood attributes, location, socioeconomic characteristics, urban form, national economy and policy. From the study, knowledge gap established was that little have been done on urban form in relation to housing price determinant. More specifically, urban densification as a determinant of housing price is not given adequate attention. Also, hedonic model is the most used method in housing price analysis from the previous literature while Artificial Neural Network is given less preference. This establish basis for further researches in the housing market.

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