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**SCHOOL OF ENVIRONMENTAL TECHNOLOGY
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**CONTEMPORARY ISSUES
AND SUSTAINABLE PRACTICES
IN THE BUILT ENVIRONMENT**

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Volume 1

Editors

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School of Environmental Technology,
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FOREWORD

The organising committee of the 2nd School of Environmental Technology International Conference is pleased to welcome you to Federal University of Technology Minna, Niger State Nigeria.

The conference provides an international forum for researchers and professionals in the built and allied professions to address fundamental problems, challenges and prospects that affect the Built Environment as it relates to Contemporary Issues and Sustainable Practices in the Built Environment. The conference is a platform where recognised best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. The scope and papers are quite broad but have been organised around the sub-themes listed below:

- Architectural Education and ICT
- Building Information Modeling
- Construction Ethics
- Energy efficiency and Conservation
- Environmental Conservation
- Facility Management
- Green Construction and Efficiency
- Health and Safety Issues
- Information Technology and Building Maintenance
- Information Technology and Construction
- Information Technology and Design
- Innovative Infrastructure Development
- Resilient Housing Development
- Smart Cities Development
- Social Integration in Cities
- Sustainable Building Materials Development
- Sustainable City Growth
- Sustainable Cost Management
- Sustainable Property Taxation
- Sustainable Architectural Design
- Sustainable Urban Transportation Systems
- Theory and Practices for Cost Effectiveness in Construction Industry
- Urban Ecology Management
- Urban Land Access
- Disasters, Resilient Cities and Business Continuity

We hope you enjoy your time at our conference, and that you have the opportunities to exchange ideas and share knowledge, as well as participate in productive discussions with the like-minded researchers and practitioners in the built environment and academia.

Local Organising Committee

**School of Environmental Technology International Conference (SETIC) 2018
APRIL 2018**

ACKNOWLEDGEMENTS

We have tried to build on the success of the maiden of SETIC held in 2016 which came with good feedbacks and memories. The success of the 2nd School of Environmental Technology International Conference holding at the Main Campus of the Federal University of Technology Minna, Nigeria is predicated on the support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology and many other highly motivated people.

I sincerely wish to appreciate you for attending this Second edition of SETIC and to warmly welcome you to the city of Minna the capital of the *POWER STATE*. It is a great honour to have you in the beautiful campus of Federal University of Technology Minna, Nigeria. I am aware of the great sacrifices made by many of you to be present in this occasion and I will definitely not overlook the long distances some of you have had to cover to get to the conference venue. We genuinely appreciate all your efforts. It is our singular hope and desire that this 2nd edition of the conference (SETIC 2018) meets your expectations and gives you unquantifiable experience and tremendous developmental networking opportunities for a life fulfilling career.

We are grateful for the presence of the Vice Chancellor of the Federal University of Technology Minna Professor Abdullahi Bala whose leadership and distinguished academic career has served as inspiration and encouragement to many academics within and outside Nigeria. His desire to continue on the path of greatness for this Humble University of ours has seen the University become a destination for International conferences, Public lectures, Book Development, Presentations and Seminars that meet International standards. We are happy to have you as the Chief host to declare the conference open and deliver the welcome address.

We are grateful to the former Dean of School of Environmental Technology, Federal University of Technology Prof A.M. Junaid and the Ag. Dean of School of Environmental Technology Prof. S.N. Zubairu for providing the healthy platform, academic backing, management and guidance for the organisation of the conference. You increased the level of challenge from 2016 and provided the required resources, direction, energy and strategies for achieving its success, it is a great honour of having the opportunity to work closely with you and learning never to give up.

I wish to thank also all the special guests particularly leaders of the Industry, Built Environment and Academia.

A special thanks goes to the Bursar of Federal University of Technology, Mrs. Hajara Kuso for the timely responses to all our requests regarding the financial aspects of access to funds for the conference.

SETIC is beginning at the foundation this year and for this I wish to thank all those who have supported us through various forms of participation. Specifically I wish to thank the delegates and the partners for contributing significantly to the conferences. I wish to thank Prof. S.N. Zubairu Prof. A.M. Junaid, Prof. O. O. Morenikeji and Prof. Y.A Sanusi, who all genuinely and consistently monitored the progress of the conference preparations. My desire in 2016 was for SETIC to become a constant feature in the calendar of the University and global conference listings, am a happy person today seeing this desire fulfilled with the SETIC 2018 edition.

Delegates to SETIC 2018 are from different academic and research institutions that are spread across different countries. This offers participants a wonderful opportunity for exchange of cultural, social and academic ideas during the conference periods. It is also an opportunity to create awareness about programmes and events at the participants' individual institutions. I encourage you all to make good use of the networking opportunities that are available.

In this 2nd edition we received 258 abstract submissions because we had a wide distribution outlet as compared to the 1st edition which is an indication of growth. Using a rapid review system we accepted a total of 209 abstracts and the authors were communicated on what issues they were to examine while developing the full papers based on their titles and aim of the paper. Two hundred (200) full papers were received and reviewed. We sent back the reviewed papers and reviewers comments forms to each of the prospective authors to assist

in the preparation of the revised papers. It was after this rigorous and time consuming process that we were able to accept 172 papers for presentation at the conference. It gives me great joy therefore to congratulate all the authors whose papers made it to the conference. It is my sincere believe that the presentation of the different ideas in your paper would go a long way in improving the knowledge of the participants and also generate meaningful discussions over the tea beaks, lunch and beyond.

I wish to express my utmost gratitude to each of the Seventy-three (73) reviewers for a wonderful job done well and for tolerating our deadlines and Oliver Twist syndrome. It is your dedication and expertise that has ensured that the conference is a success.

Special thanks to all our keynote speakers, Arc. Umaru Aliyu, (ficiArb, fnia, ppnia) (*President, Architects Registration Council of Nigeria (ARCON)*), Prof. Stella N. Zubairu (*Former Dean Postgraduate School, Federal University of Technology Minna*), Dr. Julius A. Fapohunda, (*Editor-in-Chief: International Journal of Sustainable Energy Development & Leader: Sustainable Building and Urban Growth Research Unit, Cape Peninsula University of Technology*).

It is important to appreciate the roles and efforts of the following people for their selfless and very significant contributions made towards the successful organization of the conference: Oyetola Stephen, Alonge Olubunmi, Lynda Odine, Adedokun John, Idowu Oqua, Bamidele Eunice and Muhina Lami (for being available to run around at very short notice),

The organisation of this conference would not have been this easy without dedicated individuals offering to serve. My heartfelt gratitude goes to Dr. Taibat Lawanson, Dr. R.A. Jimoh, Dr. L.O. Oyewobi, Dr. N.I. Popoola, Dr. Lekan Sanni, Dr. I.B. Muhammad, Dr. A.A. Shittu and Dr. A. Saka for their unflinching support all through the process.

It is our sincere hope that this conference will serve as a forum for the advancement of research in the urban sphere towards achieving a sustainable environment. It is our sincere believe that academics and professionals in practices will continually participate in this forum.

Worthy thanks goes to the members of the Local Organising Committee for the tireless effort. The success of the conference goes to these wonderful people. You have made SETIC 2018 to ROCK.

Once again I wish to thank you all for creating time out of your busy schedule to attend this conference. Please do enjoy your stay at Federal University of Technology Minna, and the city as a whole. Ensure that you make use of the different fora created throughout the conference to build new relationships for the future and strengthen existing relationships. I look forward to seeing you all in future.



Olatunde Folaranmi ADEDAYO
SETIC 2018 LOC Chairperson
APRIL 2018

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DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

10th APRIL 2018

TO WHOM IT MAY CONCERN

I wish to state that all the papers published in SETIC 2018 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, blind review of full papers by minimum of two referees, forwarding of reviewers' comments to authors, submission of revised papers by authors and subsequent evaluation of submitted papers by the Scientific Committee to determine content quality.

It is the policy of the School of Environmental Technology International Conference (SETIC) that for papers to be accepted for inclusion in the conference proceedings it must have undergone the blind review process and passed the academic integrity test. All papers are only published based on the recommendation of the reviewers and the Scientific Committee of SETIC

Names and individual affiliation of members of Review and Scientific Committee for SETIC Conference 2018 are published in the SETIC 2018 Conference Proceedings and made available on www.futminna.edu.ng

Olatunde Folaranmi ADEDAYO
Chairman SETIC 2018
Federal University of Technology, Minna, Nigeria

Papers in the SETIC 2018 Conference Proceedings are published on www.futminna.edu.ng.

RESIDENTIAL PROPERTY INVESTMENT RETURNS INEQUALITIES IN ILORIN

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One of the important investment decisions is the issue of realisation of the returns on the capital invested. Critical decision on increase of returns in property investment as well as factors which determine the level of returns and impact upon the attractiveness of a residential property investment allows capital owners to make effective and rational investment decisions. This study investigates, the influence of infrastructural facilities on residential property investment returns in Ilorin, Nigeria. The sample frame for the study is 762 across the selected neighbourhoods in Ilorin and the Cochran (1963) formula calculation was adopted to arrive at 317 as sample size. The data collected was subject to quantitative analysis with data handling techniques using: Co-efficient of Variation, Mean, Standard Deviation and Sharpe index to test the relationship between the average return, annual income of residential property in Ilorin. The study revealed a high positive linear correlation between infrastructure and the residential property investment returns; an indication that the infrastructure reasonably predicts residential property investment returns. The study also demonstrated that the availability of functional urban infrastructure leads to property gains which relatively create high residential property investment returns.

Keywords: Residential Property Investment, performance, Returns and Infrastructure.

INTRODUCTION

The significance of infrastructure in an urban economy cannot be downplayed because it plays a vital role in the growth and development of any urban setting and this in-turn creates attraction for all forms of investments with the inclusion of real estate investment. Development of property investments performance indicators such as value indices, yields and total returns promote improvement in the analysis of the residential property investment returns to a large extent and the effects of infrastructure creates one of the platforms upon which the profit or returns on real estate investment stands. All over the world, lack and inadequacy of infrastructure is among one of the worst nightmares bedeviling real estate investment because it has the capability to erode the value of corporate earnings in form of returns on investment and devalue the purchasing power of the real estate investors. Tomlinson (2001)

Bello (2006) Property investment is a real property that has been purchased or by way of construction with the intention of earning a return on the investment either through rent, the future resale of the property, or both. An investment property can be a long term endeavour, such as an apartment building, or an intended short term investment in the case of flipping (where property is bought renovated and sold at a price). John (1998) Property investment is like any other investment, the goal is to generate profit. In real estate, the goal is achieved through income (rent for example) or through a profitable sale of the constructed or renovated ones. Returns on property investment indicate the percentage of the invested money returned to a property investor after the deduction of associated costs.

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Other property investment indices are, price base index, level and type of information index and market capitalisation index. The returns on property investment on the other hand, is dependent upon many characteristics associated with that property such as physical characteristics of property; location of the site in relation to employment centers and other facilities, accessibility and economic characteristics of neighborhood. There is realization that real estate is a major source of capital appreciation and a good hedge against inflation, the real estate market is coming close in popularity and importance to the money and capital markets. Empirical studies have also suggested that one of the principal reasons investors favour property investment relative to other investment media has been attributed to the superior investment performance (Coyne et al. 1980; Ibbotson & Siegel, 1984; MacGregor 1992; Anushree 2013, & Hoesli and MacGregor, 2002).

It is on the above premise that, this study examined the relationship between the availability of infrastructure and real estate development for investment purposes in Ilorin the Kwara State Capital. This is done to determine, mostly, the effect of infrastructure on residential property investment returns in some selected neighbourhood in Ilorin. The low performance of residential property investment returns is attributed to inadequate infrastructure. In other word, the property investment indices already developed have not adequately captured the condition of infrastructure in the selected areas. The returns on residential property investments cannot be viewed as being sustainable due to inherent problem of inadequate and functional deficiency in housing infrastructure.

This study covers residential properties developed for investment purpose in some selected neighbourhoods of Ilorin. The study area is categorised into low, medium and high densities residential areas and nine residential neighbourhoods are chosen. This study is restricted to residential properties meant for investment purposes in Ilorin for the period of 2008 to 2017.

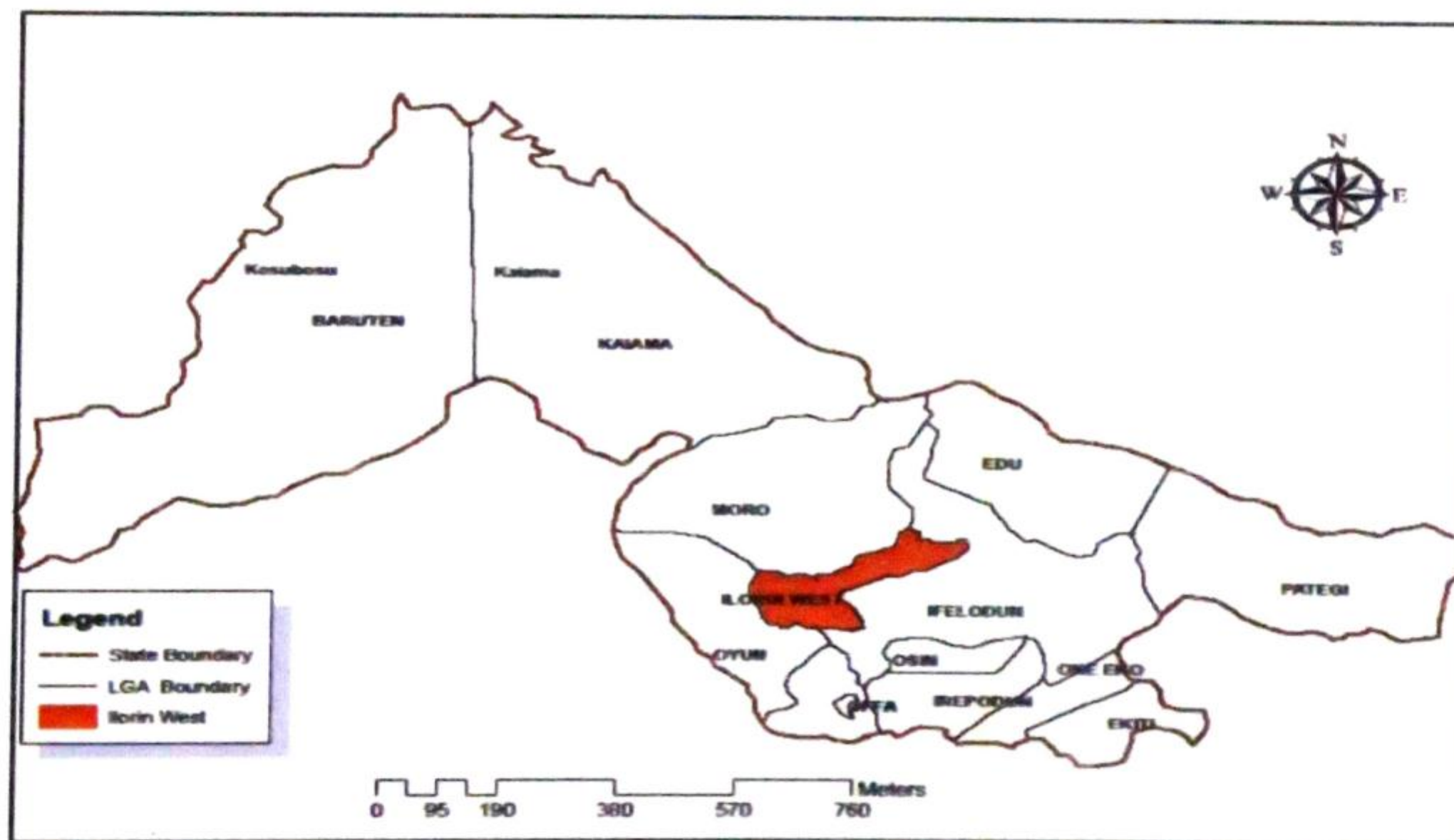


Figure 1: Map of Kwara State showing Ilorin, the State Capital
Source: Kwara State Bureau of Land and Housing, (2017)

The Concept of infrastructure

Ajayi (1998) asserted that investment is the act of laying out money or capital in return for a future reward. He further explained that the anticipated reward from investment may be in form of an income flow or by the receipt of a single capital sum or a combination of both; and that investment may not guarantee returns and it may not involve the investor in furthering action to obtain returns. According to Ogbuefi (2002), investment can be seen as parting with present capital in return for future income. Essentially the primary purpose of investment is the future income. The income an investor expects from an investment can take two basic forms; income earned in form of interest, dividends and profits realized from appreciation in value and rents from the investment. Ogbuefi (2002) also classified investment into two; financial assets and non-financial assets. Investment, as indicated by Olujimi and Bello (2000) is expenditure of an existing capital sum in anticipation of future benefits. If the benefits are measured in monetary term it may be in form of annual income if the investment is retained; or profit on the sale of such investment. For the analytical purposes, the return of benefits from most investments is measured in monetary terms.

However, a rational investor is expected to minimize risk in order to maximize returns from his investment. To ascertain the level of return from an investment, there is need to appraise comparatively the return from the subject investment with alternative investments, understanding its nature outlets, strength and weakness. Investment can be regarded as an act of laying down or surrendering the present capital with the expectation of reaping the benefits in future in form of returns which habitually takes the form of an income flow and capital increase (Payne & Holt 2002).

According to Leonard (2011), a return is the gain or loss of a security in a particular period. The return consists of the income and the capital gains relative on an investment and it is usually quoted as a percentage. The general rule is that the more risk one takes in an investment, the greater the potential for higher returns and losses as the case may be. It must be noted here that, while some investors will settle for principal protection, most investors are in search of return, specifically alpha returns (chief or dominant). Alpha returns are generated when an investment generates more money than its costs. In general, there are three different types of return on investment, return on equity and return on assets. Each one is essentially calculated the same way, but the inputs have different labels.

Property Investment Returns: The market Approach

Time-weighted rate of returns (TWRRs) for the sub-periods are chain-linked or compounded together to get the time weighted rate of return (TWRR) for the whole measurement period. Dubben and Sayce (1991) time-weighted rates are calculated every time a cash flow occurs, and every time rent is received on a property or expenditure the return to that point in time is calculated and is regarded as the return for that period. Subsequently, the return may be chain-linked together to give total return or time weighted rate of return. In this sense return for a period is therefore a geometric mean for given number of properties held as investment. The time weighted rates of return is defined as geometric mean of rates of return achieved over each period contained in the holding period and thereby additional capital injections are to be included into the cash flows and into the capital at work. Time-weighted rate of return is the single rate of compounding interest which will produce the same accumulated value over more than one period as would be produced by the component single period interest rate. The approaches to property investment returns have been used in several studies (Daniel et al, 2014; Umeh & Oluwasore, 2015), developed empirical analysis of total, capital and income returns in Akure. The analysis of trend revealed that total returns overlapped both capital and total returns. Therefore total return is the sum of both capital and total returns. Umeh and Oluwasore (2015) adopted the use of total return indices as a basis for the modeling the influence of inflation. The various approaches to property return are as follows:

Return from Growth

The simple growth rate is a function of past and present values of the property investment; it is calculated by subtracting the past value from the present value and then dividing by the past value. The formula is

$$\text{Return from Growth} = \frac{(\text{Present Value of Investment} - \text{Past Value of Investment})}{\text{Past Value of Investment}}$$

Capital Return

Capital or market return may be defined as the amount of money which may be obtained for an interest at a particular time from those individuals who are willing to purchase it. It has already been established that those willing and able to purchase property for investment require a return in form of rent per annum (Isaac & Enever, 2002). However the investor may incur outgoings, which are annual expenses such as management cost and repairs. This may be deducted from the rent to give the amount which constitutes the true return – income per annum.

$$\text{Capital Return} = \frac{CV_t - CV_{t-1}}{CV_{t-1}}$$

Total Return

When measuring performance of an investment, the actual rate of return of such investment or a pool of investment over a given evaluation period of time which includes interest, capital gains, dividends and distributions realized over a given period of time referred to as total

registered houses with the Power Holding Company of Nigeria (PHCN) in each of the neighbourhoods of the study areas after which Ground-truthing was carried out to update and verify the data from PHCN, along with identification of residential rental properties within each of the selected neighborhoods across the study areas. The sample frame for the study letting and sale transactions are 3,419 and 702 respectively across the selected neighbourhoods. Cochran (1963) formula for sample size calculation was adopted; in order to have a good representation for the study areas. The model is described below:

$$n_0 = \frac{Z^2pq}{e^2}$$

where n₀ represent sample size, N represents population size, p represents 95% confidence level of the population, q = 1-p, e represents acceptable error, Z = 1.96 which is referred to as the standard normal deviation. Therefore, the sample size for the 762 letting transactions and 317 sales transactions were sampled across 23 registered firms in Ilorin (NIESV, 2016).

Mathematically, the analytical methods used are expressed as follows:

$$\text{Total Return} = \frac{(CV_1 - CV_0) + R}{CV_0}$$

$$\text{Income Return} = \frac{\text{Rent}}{\text{Capital value}} * 100$$

$$\text{Capital Return} = CR = \frac{(CV_1 - CV_0)}{CV_0}$$

$$\text{Coefficient of Variation} = \frac{\text{Standard Deviation}}{\text{Mean}}$$

$$\text{Sharpe Index} = \frac{\text{Mean-Free Risk yield}}{\text{Standard Deviation}}$$

The higher the Sharpe Index the better, the performance.

DATA ANALYSIS

Table 1 shows the mean annual total return of 2 bedrooms residential property range from 9.79% to 1.96%, and the highest return was found in Basin Area at 9.79%. Basin area had highest in income return at 2.82% and capital return at 6.97. Basin constitute major area of property investment with highest returns.

Table 1 Return on 2 Bedrooms Residential Property Investments (2008-2017)

	Total Return in %	Income Return in %	Capital Return in %
Basin Area	9.79	2.82	6.97
Sabo-Oke	4.79	1.17	3.62
Unity Area	2.59	1.01	1.58
Gari Alimi	5.03	1.17	3.86
Oniganga	4.23	1.87	2.36
Tanke	5.65	1.38	4.27
Fate	4.13	0.75	3.38
GRA	4.74	2.09	2.65
Olooje	1.96	0.43	1.53
Adangba	4.46	0.98	3.48
Ita-Amodu	4.62	0.68	3.94
Centre Gboro	1.96	0.01	1.95
Garage Offa	4.49	1.02	3.47
Gaa Akanbi	6.04	0.61	5.43
Pipe Line	2.33	0.84	1.49
Taiwo Oke	3.07	0.38	2.69
Omoda	1.96	0.64	1.32
Kulende Area	4.01	1.05	2.96
Sango	2.36	0.59	1.77
Mean	4.12	1.03	3.09

Source: Authors' Field Survey, 2017

Table 2 shows the result of analysis of variance showed that there is statistically significant difference in returns across the study areas at p-value (0.000) less than 0.05 level of significant. Therefore, this further suggests that the returns across the areas are unequal due to difference in market factors.

Table 2 Analysis of Variance in Returns in 2B/R

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	94.15599	2	47.07799	23.08218	0.0000	3.168246
Within Groups	110.1374	54	2.039581			
Total	204.2934	56				

Computed from Table 1

Table 3 shows the mean annual total return of 3 bedrooms residential property and the highest return was found in Basin Area at 10.87%. Garrage Offa had highest in income return at 6.56% and Adangba had highest capital return at 7.14. Basin constitute major area of property investment with highest returns.

Table 3 Return on 3 Bedrooms Residential Property Investments (2008-2017)

	Total Return in %	Income Return in %	Capital Return in %
Basin Area	4.9	2.22	2.68
Sabo-Oke	10.87	4.86	6.01
Unity Area	8.12	2.86	5.26
Gari Alimi	6.46	2.4	4.06
Oniganga	4.61	2.07	2.54
Tanke	8.43	3.56	4.87
Fate	5.45	1.86	3.59
GRA	4.21	1.4	2.81
Sango	7.21	1.47	5.74
Adangba	9.21	2.07	7.14
Ita-Amodu	9.21	3.02	6.19
Centre Gboro	3.66	1.1	2.56
Garage Offa	8.57	6.56	2.01
Gaa Akanbi	5.31	2.26	3.05
Pipe Line	3.36	0.73	2.63
Taiwo Oke	5.19	2.01	3.18
Omoda	2.45	0.49	1.96
Kulende Area	2.2	0.54	1.66
Mean	6.08	2.30	3.77

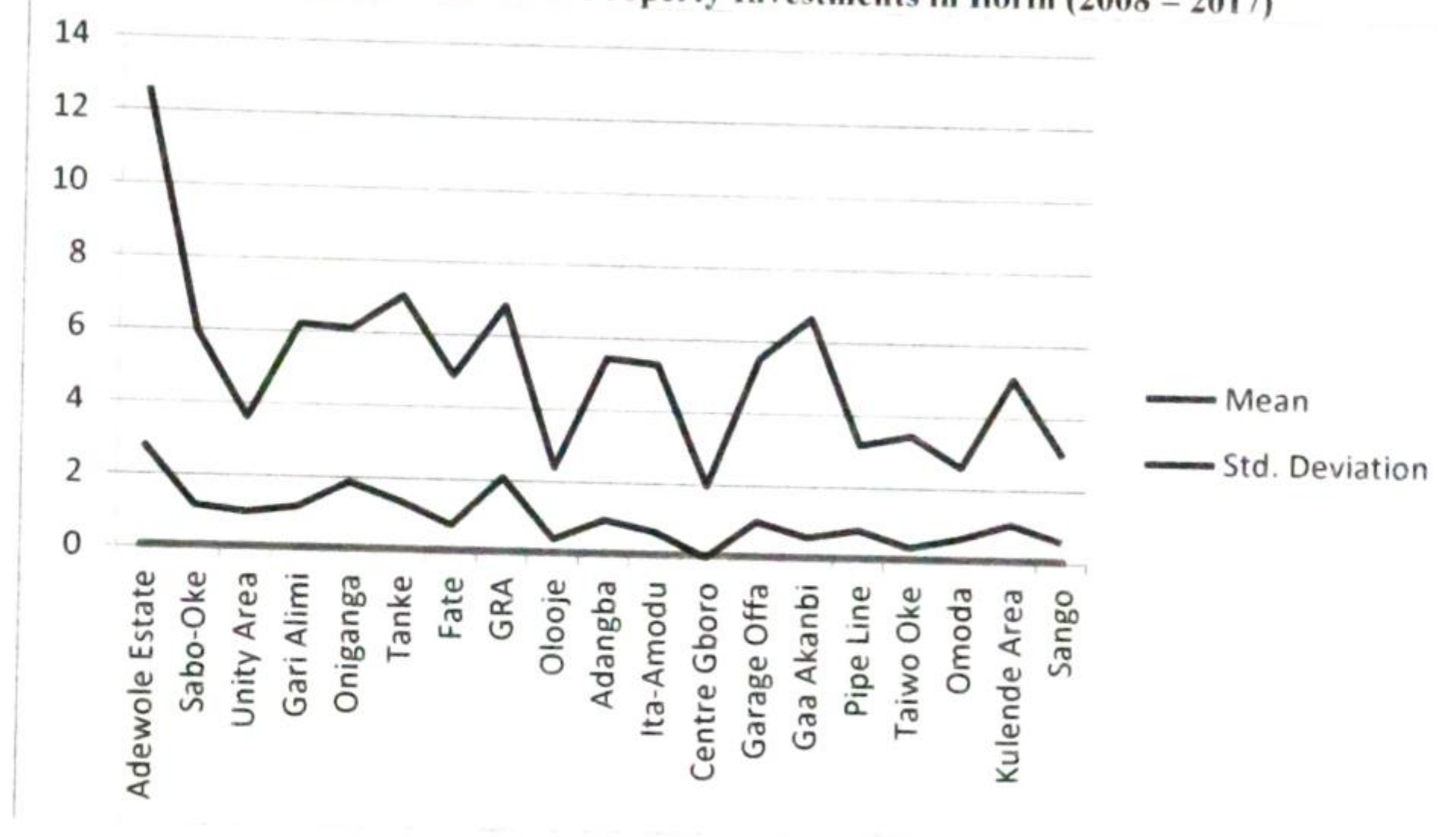
Source: Authors' Field Survey, 2017

Table 4 shows the result of analysis of variance showed that there is statistically significant difference in returns across the study areas at p-value (0.000) less than 0.05 level of significant. Therefore, this further suggests that the returns across the areas are unequal due to difference in market factors.

Table 4 Analysis of Variance in Returns in 3B/R

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	130.3068	2	65.15339	16.85021	0.000	3.178799
Within Groups	197.1977	51	3.866621			
Total	327.5044	53				

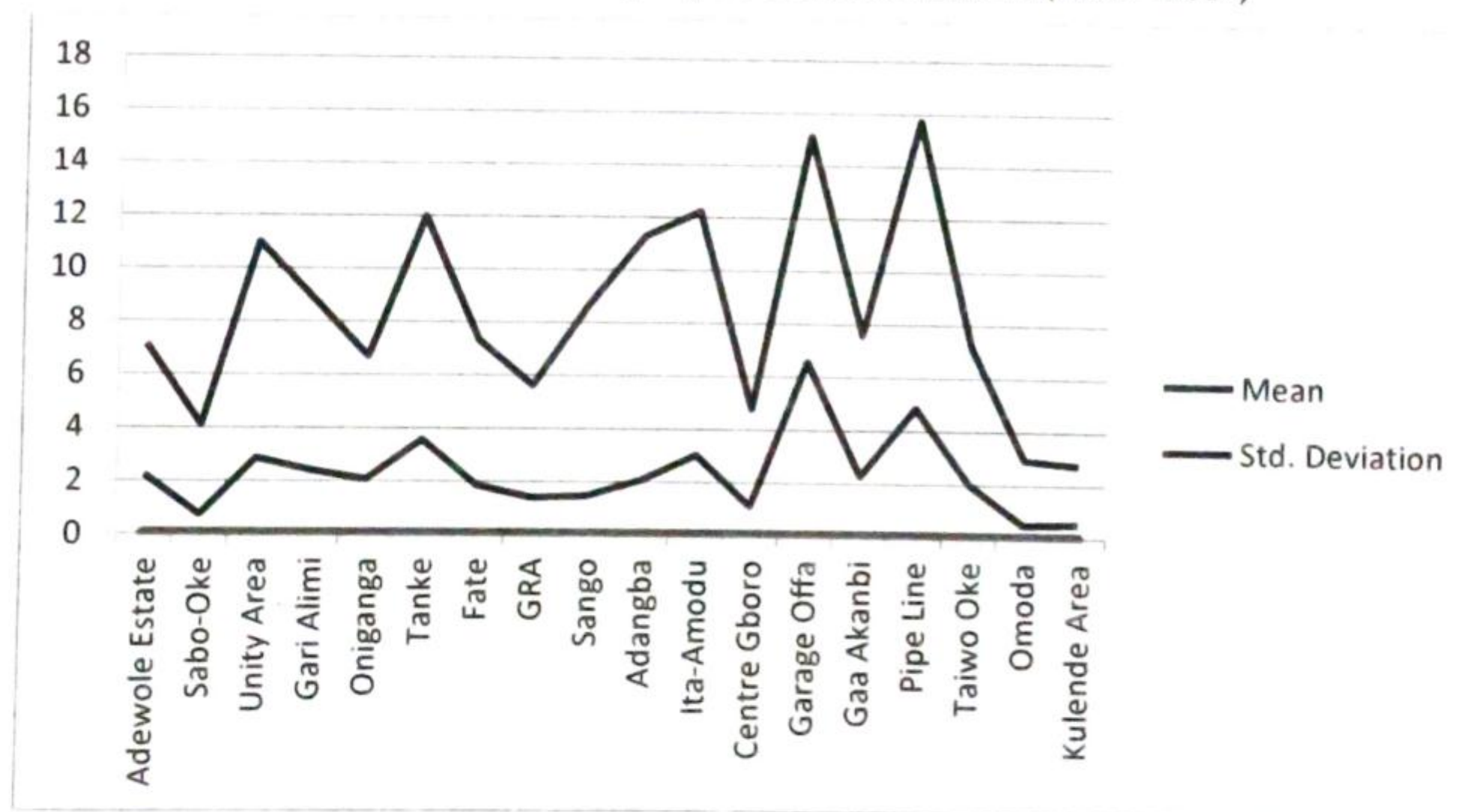
Returns of 2 Bedroom Residential Property Investments in Ilorin (2008 – 2017)



Returns of 2 Bedroom Bungalows in the selected areas of Ilorin

The results above show the analysis of total return on 2 bedrooms residential property. The average return shows that Basin area has highest average return at 9.79%, Tanke has 5.65% and Gari Alimi has 5.03% average return while Olooje, Centre Gboro and Omoda have 1.96% as the lowest return. On this note Adewole Estate performed better than any other location but the market is not stable because the differences between nominal mean and geometric mean at 9.79% and 2.82% respectively is too wide. Therefore this makes Gari Alimi and Tanke a better investment market than any location for 2 bedrooms residential property investments in Ilorin.

Returns of 3 Bedroom Residential Property Investments in Ilorin (2008 – 2017)



Returns of 3 Bedroom Bungalows in the selected neighbourhoods of Ilorin

The above shows the analysis of total return on 3 bedrooms residential property. The average return showed that Pipe Line has highest average return at 10.87% and Unity Area has 8.12% average return, Omoda and Kulende Area have the lowest average return of 2.45% and 2.2% respectively. On this note Pipe Line performed better than any other location like Kulende and Omoda. This makes Pipe Line a better investment market than any location for investor in 3 bedrooms residential property investments in Ilorin.

CONCLUSION AND RECOMMENDATIONS

From result, Adewole Estate was identified as a better market for 2 bedrooms residential property investment compared with other neighbourhoods in ilorin with an average return of 9.79% and a risk of 7.2%. The investment market was also found to be less volatile and as such the best for the investment of 2 bedrooms residential property. Investors can

conveniently invest their resources in Tanke for 2 bedrooms residential property and make good profit from the investment.

Pipe Line performed better in terms of providing high return for 3 bedrooms residential property at 10.87%. The investment market is less volatile and risky. Conclusively, residential property investment performed well with positive mean returns throughout the period under review. The result of the analysis indicates that returns on residential properties are higher with 9.79% for 2 bedrooms and 10.87% for 3 bedrooms are encouraging as Ilorin is still growing in terms of real estate

With reference to this study and its findings, the following recommendations are found worthy for the full utilization of the accrued benefits derivable from this research. They include: Estate Surveyors and Valuers should keep a database on the return from property investment so as to adequately advise property investors on the type of property to invest in a particular location. Tanke as an investment market is good for the investment of 2 bedroom residential property and it is less risky when compared with other neighbourhoods. Pipe Line as an investment market is good for the investment of 3 bedroom residential property when compared with other areas in Ilorin. Investors who are risk adverse can invest in Tanke investment market for 2 bedrooms residential property as it performed better than other location with a less risk. The supply of residential property should be checked as it may soon overtake the demand leading to the problem of void.

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