



**FEDERAL UNIVERSITY OF TECHNOLOGY  
MINNA**



**SCHOOL OF ENVIRONMENTAL TECHNOLOGY  
INTERNATIONAL CONFERENCE (SETIC 2016)**

# **SETIC 2016** *Conference Proceedings*

**EDITORS:**

**Yekeen A. SANUSI  
Olatunde F. ADEDAYO  
Richard A. JIMOH  
Luqman O. OYEWObI**

**THEME:**

**SUSTAINABLE BUILT ENVIRONMENT  
AND CLIMATE CHANGE:  
THE CHALLENGE OF POST 2015  
DEVELOPMENT AGENDA**

**DATE:**  
**TUE. 10TH - THUR. 12TH  
MAY, 2016**

**VENUE:**  
**SCHOOL OF ENVIRONMENTAL  
TECHNOLOGY COMPLEX**

**TIME:**  
**9:00AM - 5:00PM  
DAILY**

**CHIEF HOST:**  
**PROF M. A. AKANJI**  
VICE CHANCELLOR, FEDERAL UNIVERSITY  
OF TECHNOLOGY, MINNA

**HOST:**  
**PROF Y. A. SANUSI**  
DEAN, SCHOOL OF ENVIRONMENTAL TECHNOLOGY,  
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

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**School of Environmental Technology  
International Conference  
(SETIC) 2016**

**10-12 May 2016**

**Federal University of Technology Minna,  
Niger State, Nigeria**

**Conference Proceedings**

**Editors**

**Yekeen A. SANUSI,  
Olatunde F. ADEDAYO,  
Richard A. JIMOH,  
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Conference Proceedings of the School of Environmental Technology International  
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10th – 12th May 2016  
School of Environmental Technology,  
Federal University of Technology, Minna, Niger State, Nigeria.

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## **FOREWORD**

The organising committee of the 1<sup>st</sup> 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 Climate Change and Sustainable Development. The conference is a platform where recognised best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. The papers and scope are quite broad but have been organised around the sub-themes listed below:

- Infrastructure Development and Financing
- Sustainable Practice Theories
- Urban Resilience and Energy Conservation
- Waste Management and Sanitation
- Health and Safety Issues
- Climate Change and Threat to Sustainability of the Built Environment
- Climate Change Induced Disaster
- Designing the Human Settlement for Climate Change
- Conceptual Issues on Climate Change and Sustainable Development
- Sustainable Materials
- Cross Cutting Issues

The peer review process saw us making use of 48 senior academics and specialist as reviewers drawn from institutions in Nigeria and England. There were some papers were outside the theme of the conference but we had to create a cross cutting issues to accommodate such papers this is in spirit that every knowledge is important.

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.

Professor Yekeen Adeeyo Sanusi  
Conference Chair  
School of Environmental Technology International (SETIC) 2016  
Federal University of Technology Minna, Niger State Nigeria.  
May 2016



## ACKNOWLEDGEMENTS

The success of the 1<sup>st</sup> 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 and many other highly motivated people.

I sincerely wish to appreciate you for attending this maiden event 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, **THE MOST PEACEFUL UNIVERSITY IN 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 this conference venue. We genuinely appreciate all your efforts. It is our singular hope and desire that the conference 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 Musbau Adewumi Akanji whose leadership and distinguished academic career has served as inspiration and encouragement to many young academics. His desire to see the University compete at International level has led to the upsurge in the organisation of International conferences, Public lectures and Seminars on regular basis within and outside the university. 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 Dean of School of Environmental Technology, Federal University of Technology Professor Yekeen Adeeyo Sanusi for providing the robust platform, academic support and leadership for the organisation of the conference. You threw the challenge and provided the required resources and strategies for achieving its success, it is a great honour of having the opportunity to learn at your feet. We are happy to have you as the host and keynote speaker at the conference. I wish to thank also all the special guests particularly leaders of the Industry, Built Environment and Academia.

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. Oluwole O. Morenikeji (DVC Academic), Prof. Stella N. Zubairu and Prof. A. M. Jinadu who genuinely and consistently monitored the progress of the conference preparations. It is my desire that SETIC becomes a constant feature in the calendar of the university and global conference listings.

Delegates to SETIC 2016 are from 39 different academic and research institutions that are spread across six 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.

We received a total of 226 abstract, based on a quick review we were able to accept 175 of them and the authors were communicated on what they needed to focus on while developing the full papers. A total of (129) full papers were received and reviewed, the reviewers report for the authors to make corrections and submit revised papers. It was after the process that we were able to accept 112 papers for presentation at the conference, I therefore congratulate all the authors whose papers made it to the conference. We acknowledge the amount of hard work you had all put in producing these papers. 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 at the tea beaks, lunch and beyond.

I wish to express my utmost gratitude to each reviewer for a wonderful job done 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, Prof. Oluwole O. Morenikeji (Deputy Vice-Chancellor Academics, Federal University of Technology Minna), Prof. Hussein Makun (Director, Directorate of Research Innovation and Development, Federal University of Technology Minna), Prof. Musa Aibinu (Director, Centre for Distance Learning), Prof. Mustapha Zubairu (Director, Centre for Human Settlement and Urban Development), Dr. Appolonia A. Okhimamhe (Director, WASCAL) and Prof. Yekeen Sanusi, (Dean School of Environmental Technology, Federal University of Technology Minna).

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: Adedokun John, Idowu Oqua, Akhabue Oriwoh and Ailoyafen Dorcas (for being available to run around at very short notice), Arc. Oyetola Stephen and Tpl Samuel Medayese (for typesetting the papers for the conference proceedings).

I have come to realise that it is not easy to organize conference without dedicated individuals offering to serve. My heartfelt gratitude goes to Dr. R.A. Jimoh, Dr. L.O. Oyewobi, Dr. Taibat Lawanson, Dr. P. Ayuba, Dr. J.J. Dukiya, Dr. A.I. Anunobi, Dr. N.I. Popoola and Dr. O.A. Kemiki 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.

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  
Chairman SETIC 2016 Organising Committee  
May 2016

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## **DECLARATION**

### **PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT**

10th May 2016

TO WHOM IT MAY CONCERN

I wish to state that all the papers published in SETIC 2016 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 2016 are published in the SETIC 2016 Conference Proceedings and made available on [www.futminna.edu.ng](http://www.futminna.edu.ng)

Olatunde Folaranmi ADEDAYO  
Chairman SETIC 2016  
Federal University of Technology, Minna, Nigeria

Papers in the SETIC 2016 Conference Proceedings are published on [www.futminna.edu.ng](http://www.futminna.edu.ng).

## REVIEW PANEL

We wish to express our deepest and sincere gratitude to the following people in no particular order who provided comprehensive scientific reviews and made commendable suggestions towards improving the over 200 abstracts and 100 full papers submitted to SETIC 2016. They provided constructive comments to authors regarding their papers, it is necessary to state that there was no reported case of conflict of interest by any of the reviewers or the authors.

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# IMPACT OF A TERTIARY INSTITUTION ON THE INFRASTRUCTURE DEVELOPMENT OF THE HOST COMMUNITY

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Federal university of Technology, Minna developed its main campus in Gidan-Kwano and started operation in 2005. This work examines the impact of university on the host community. Landsat imageries were used to monitor spatial growth in Gidan-Kwano between year 2005 and 2015. Ground survey data were collected from Federal university of Technology, Minna, Estate Agents, Property developers, Power Holding Company of Nigeria and Ministry of Lands and Housing. ILWIS was used to analyse the satellite imageries while Analyze-it was used for the analysis of the ground survey data. Findings revealed that residential land use which stood at 8.87% of the total land use in 2005 has now grown to 25.19% in 2015. There are other infrastructure attracted to the area during period under review. However, the growth has been marked with problems of uncoordinated development and inadequate infrastructure. The ever increasing population of the university will continue to attract physical development and if the growing development is not coordinated by enacting master plan, there will be chaotic and haphazard development. The study has revealed the spillover effects of locating university. It has also unfolded the pending danger of uncontrolled development. A comprehensive master plan should be developed for the community.

**Keywords:** Impact, University, Residential, Development

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Kemiki, O.A. et. al. (2016). **IMPACT OF A TERTIARY INSTITUTION ON THE INFRASTRUCTURE DEVELOPMENT OF THE HOST COMMUNITY** Sustainable Built Environment and Climate change; The challenges of Post 2015 Development Agenda. School of Environmental Technology Conference, SETIC, 2016



## 1. Introduction

[1] Advanced that foreign direct investment has multiple effects on the economy of a host country. Relatedly, investment made in a particular local environment has impacts on the host community. Many researchers in the past and even till now have been focusing on the economic, social and cultural impact of tertiary education institutions to communities [2,3,4,5]. Meanwhile little or no attention has been given to the impact of university or tertiary education institutions on the physical development of host communities. It is within this analytical context that this research is conceived. Federal University of Technology Minna created in 1983 started operation in Bosso area of Minna. The growth of the Institution necessitated the development of a new permanent site in 2005 in Gidan-Kwano area of Minna. The main campus which is sited in Gidan-Kwano on 10,650 hectares of land houses majority of the faculties. Since the relocation in 2005, the once agrarian area has witnessed development of modern accommodations. Further to this, the host community has continued to enjoy other public and private physical developments.

In the report by [3] higher education is a major source of jobs in New York State. The number of jobs in higher education has been growing more rapidly than employment in the rest of the economy. During the 2001-2003 recession, higher education employment rose by 5.8 percent in New York while jobs in the rest of the State's economy declined by 2.6 percent. During the 2003-2007 economic expansion, higher education employment in New York grew by 4.8 percent, compared to job growth of 4 percent in the rest of the economy. More recently, higher education employment in New York grew by 2.7 percent between 2007 and 2009. The State's public and private colleges and universities provided 266,110 jobs in 2009 or 3.2 percent of all employment in the State and paid out \$13.2 billion in wages. Higher education institutions contribute to the quality of life in their communities, providing services such as medical facilities, research centers, libraries, sports, arts, and cultural events. In many parts of the State, these schools account for a significant portion of local economic activity.

The aim of the research conducted by [6] was to determine the type of corporate social responsibilities schemes provided by tertiary institutions vis-a-vis the types of social responsibilities needed by the host communities with associated challenges. This study employed the survey design method. Management staff of the selected three (3) tertiary educational institutions numbering twenty-five (25) was selected via stratified random sampling method while fifty-five (55) prominent community leaders were randomly selected from the three host communities. The mean( $\bar{x}$ ), Standard deviation (SD) and the t-test were the statistical tools used. Findings revealed that tertiary institutions in Delta State of Nigeria are socially responsible to their host communities by providing the following services in this ranked order: education needs; wealth and job creation; physical infrastructural development; creating and promoting cultural awareness and; health intervention. The challenges faced by tertiary educational institutions in discharging their corporate social responsibilities to host communities in Delta South include intercommunity agitations and strives; greedy community leadership, negative attitude of host communities; delay in release of funds by government to tertiary institutions and youth restiveness. The study

recommended that tertiary educational institutions should develop more deliberate schemes to meet corporate social responsibility needs of their host communities as well as ensure that adequate enlightenment should be given to host communities on the objectives of corporate social responsibilities schemes.

One of the so many factors that influence the residential or commercial location choices of households or investors is educational institutions. Others may include access to employment, business, cultural or recreational opportunities; affordability; familiarity with one location or type of location, perhaps as a result of growing up there; or emotional attachment to a place or a lifestyle [7]. To what extent has the Federal University of Technology, an education institution influenced the location choices of households and investors in Gidan-Kwano, the host community?

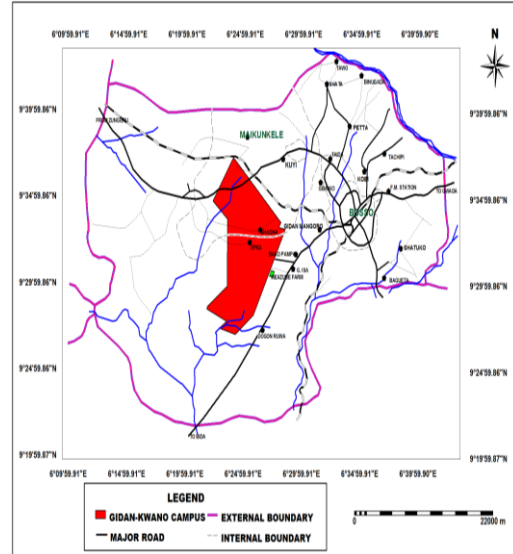
## **2. The Study Area**

The Federal University of Technology, Minna was established on February 1<sup>st</sup>1983 [8]. This specialized university was established in Niger State of Nigeria to concretize the quest for technological development in Nigeria. In the beginning, the University took over the facilities of the former Government Teachers' College Bosso, for use on a permanent basis. This site now serves as the Bosso Campus of the University. The main campus which is sited in Gidan-Kwano 10,650 hectares of land is located along the Minna - Kataeregi - Bida Road started operation in 2005. As at today, the university has Eight (8) schools and four (4) centres. As part of its overall fitness program, the University has among others a floodlit sports arena on both campuses, athletics cinder tracks, badminton indoor courts, basketball courts, volley ball courts, football pitches, a fitness gymnasium and student-run radio station. The Federal University of Technology, Minna is one of the top ten (10) universities in Nigeria and one of the top hundred (100) universities in Africa. The location of Federal University of Technology, Minna is shown in figure 1.

### **Gidan-Kwano**

Gidan-Kwano is the host community to the Federal University of Technology, Minna. The town is about 12km away from the main town of Minna which is situated along Minna- Bida Road. It lies between latitude 9<sup>o</sup>27<sup>i</sup>N to 6<sup>o</sup>27<sup>i</sup>E. Original settlers in Gidan-Kwano were farmers. Now, Gidan- kwano houses several students and staff of the Federal University of Technology, Minna. Gidan- Kwano area of Minna, Nigeria had been a predominantly village setting with mud houses and very scanty housing development with agrarian economy. Since the operation of the Federal University of Technology, Gidan-Kwano campus, the village has witnessed astronomical housing development as investors continue to develop off campus accommodation for students with attendant commercial activities. The location of Gidan-Kwano is shown in figure 1.

*Figure. 1: Google Earth Map and Digitized Map of Federal University of Technology and GidanKwano*



### 3. Methodology

Google earth maps, digitized maps and land use maps of 2005, 2012 and 2015 were obtained and analysed in a remote sensing environment using ILWIS 3.1 to analyse the land use variation over time experienced in the study area. Historic and present pictures were also used to explain the variations. Other sources of information include ministry of lands, National Population commission, PHCN and village heads. The data obtained were analysed descriptively.

### 4. Results and Discussions

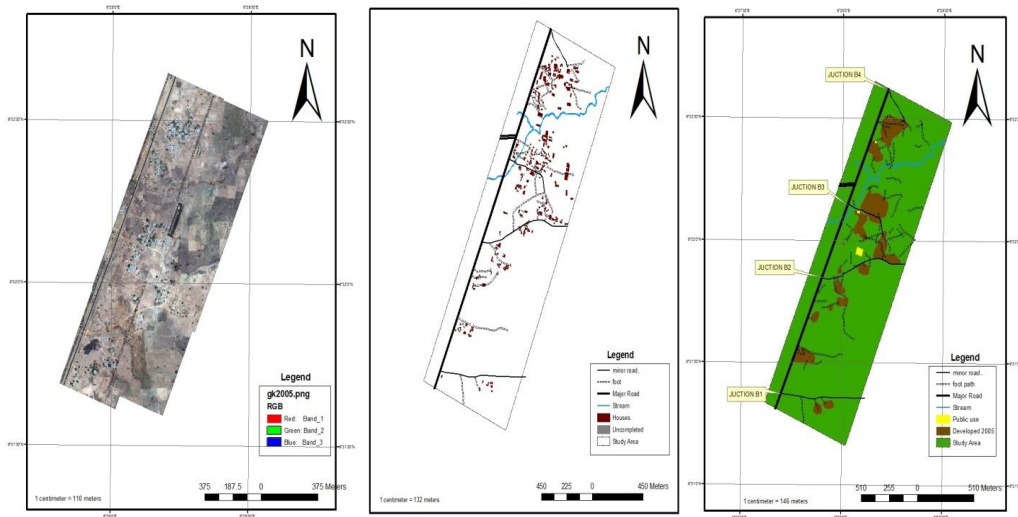
#### *Gidan-Kwano(Host Community) prior 2005*

Gidan-Kwano village prior to the sitting of the permanent site of the Federal University of Technology, Minna was observed to be inside the university site. Acquisition of the mass of land for educational purpose by the Federal government of Nigeria; was facilitated by the Land Use Act of 1978, that states that all land are entrusted into the hand of government. The move taken thereafter was to resettle the indigenious communities, farm stead and villages away from the university site to the present site of the village opposite the university main entrance retaining the same old name of the village known as Gidan-Kwano.

#### *Assessment of Host Community in 2005*

This revealed the existing situation of GidanKwano as at 2005 when the Federal University of Technology, Minna started its operation as shown in Figure 2, the Google earth image, digitized map and the land use map in 2005.

*Figure 2: Google Earth Image, Digitized Map and Land Use Map of GidanKwano in 2005*



Source: Urban and Regional Planning Department, FUT, Minna

Figure 2 reveals the level of development in 2005. The same year, Federal University of Technology, Minna moved to the permanent site at GidanKwano. The analysis of the digitized image of the land use of the area shows that 90.7% of the total land mass of the area are meant for agricultural purpose, while the area for residential and other uses was 9.3%. The activities of the host community were mainly agrarian, while the population stood at 485 persons with the total number of houses which was less than 100 housing units of habitable standard.

The characteristics of the housing in GidanKwano in GidanKwano in 2005 were mainly mud houses and traditional buildings.

*Plate 1: The Mud houses of GidanKwano in 2005.*





Taking into account the level of developments in Gidan-Kwano in 2005, the report confirmed that infrastructural development were not available as depicts in Table 1.

Table 1: Nature of Infrastructural development of Gidan-Kwano in 2005

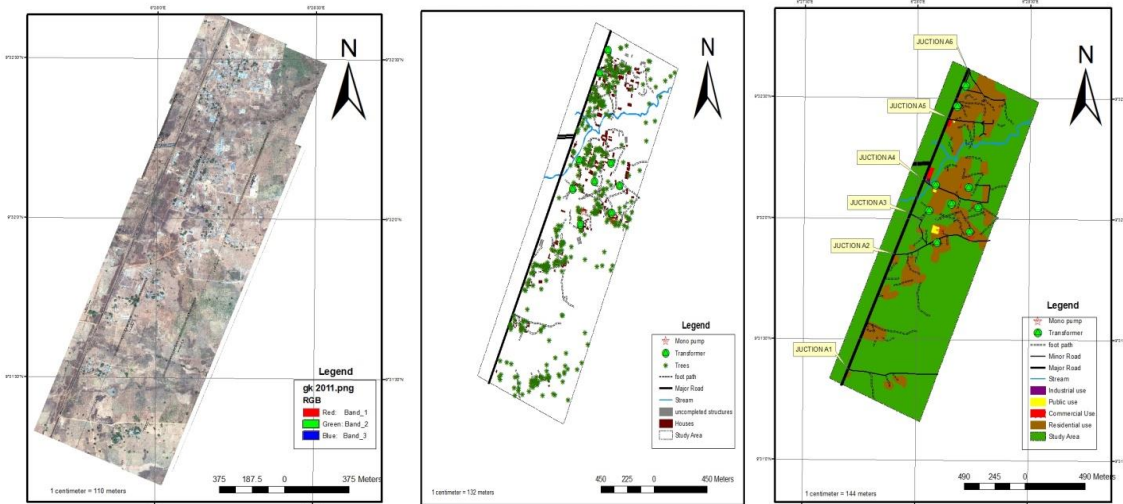
Facility	Remark
Water Supply	1 borehole
Electricity	No transformer and Electric poles
Accessibility	Earth road and narrow
Drainages	The main drainage has no culvert
Health	No health facility
Education	No primary school

Source: Department of Urban and Regional Planning, FUT, Minna

### ***Assessment of Host Community in 2012 and 2015***

As at 2012, Gidan-Kwano has witnessed astronomical housing development. Figure 3 shows the Google earth image, digitized map and the land use map in 2012.

Figure 3: Google Earth Image, Digitized Map and Land Use Map of GidanKwano in 2012



Source: Urban and Regional Planning Department, FUT, Minna

Figure 3b: Land Use Map of Gidan-Kwano in 2015

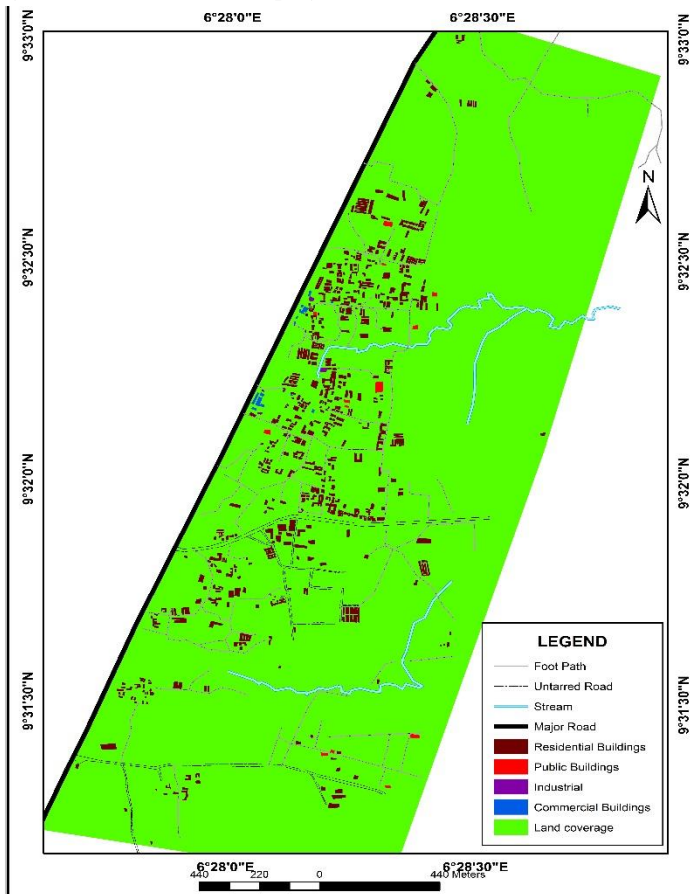


Figure 3 shows the changes that have occurred in the study area after 2005. The figure reveals that in 2012, impacts of the Federal University of Technology, Minna were more pronounced in the area in terms of expansion of residential buildings and infrastructural development. Considering the situation of the university host community in 2012, residential and other buildings increased beyond 22% while the agricultural land uses reduced to 77%. The habitable housing units in 2012 stood at 456 houses, which were characterised by block housing, modern flats including those that investors made available for students and other people in the area. The population of the people in Gidan Kwano in the year 2012 was 2,329 [9]. As at 2015, residential land use increased to 25.19% with a corresponding reduction in agricultural land use which stood at 74.07%. As at 2015, total number of houses stood at 644, representing 41.2% increase over 2012.

In terms of the Infrastructural development provision at the study area, Table 2 shows the changes and development now available in 2012.

Table 2: Physical development of GidanKwano in 2012/2015

Facility	Remark
Water Supply	3 Mono pump, 7 private borehole
Electricity	6 transformers
Accessiblity	Expansion of old roads and creation of new ones
Drainages	Construction of bridges and drainages
Health	1 primary health care center
Education	2 primary schools (private & public)
Commercial/Industrial	3 Sawmills/ departmental stores in the town and along the major road

Source: Department of Urban and Regional Planning, FUT, Minna

Plate 2: Modern houses and Infrastructure in GidanKwano in 2015.



Modern buildings





Transformer and road network



Health care centre and primary school



Sawmill and departmental stores



Overhead Water Tank and Telecommunication Mask





### *Level of Growth and Development in Gidan-Kwano; 2005 and 2015*

This depicts the variation in growth and development of Gidan-Kwano within ten years interval (2005 – 2015).

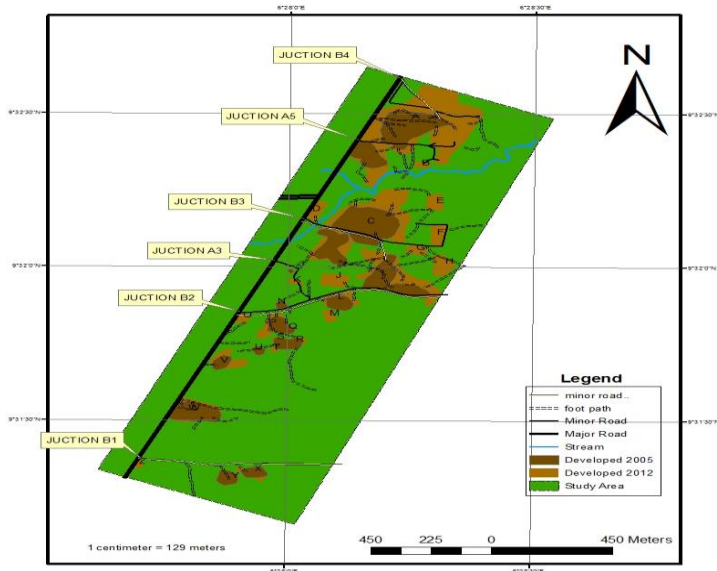
*Table 3: Variation in Land Use of GidanKwano between 2005 and 2015*

Land Use	Area coverage /percentage 2005		Area coverage /percentage 2012		Area coverage /percentage2015
Residential	182,256sqm	8.87%	461,608sqm	22.47%	518,517sqm
Agricultural	1,868,839sqm	90.96%	1,582,455sqm	77.02%	1,524,805sqm
Commercial	Nil	Nil	5,520sqm	0.27%	5,538sqm
Public/Semi public	3,444sqm	0.17%	4,403sqm	0.17%	4,590sqm
Circulatory	1,671sqm	0.08%	3,822sqm	0.19%	3,957sqm
Industrial	Nil	Nil	553sqm	0.03%	958sqm
				0.047%	

Source: Jangado, 2013;fieldwork,2015

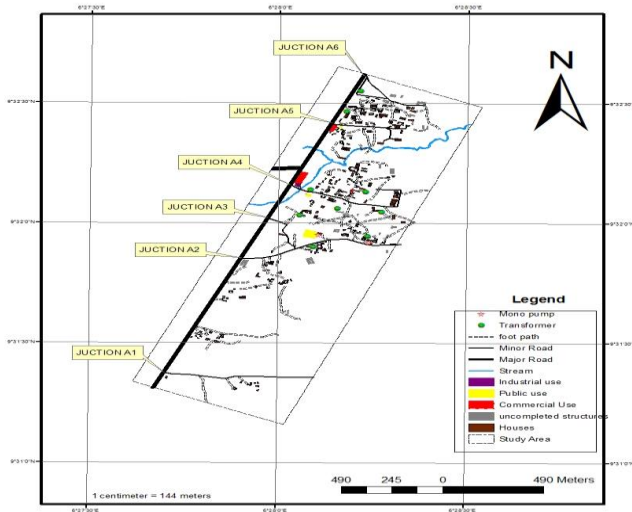
The variation of land uses as shown in Table 3 reveals the changes experienced in the area, which is reflected in all the uses. Comparing the results of the analysis in 2005, 2012 and 2015, area coverage of residential land use increased from 8.87% to 22.47% in 2012 and to 25.19% in 2015. Agricultural land use reduced from 90.96% to 77.02% in 2012 and further reduced to 74.07% in 2015. Commercial land use increased from 0% to 0.27%, public/semi public increased to 0.22% in 2015. Circulatory use increased to 0.19% from 0.08% while industrial land use recorded an increase of 0.04%. By implication, residential land use has been greatly influenced by the movement of Federal University of Technology, Minna to the present location since 2005. Other land uses in the same like manner shared from the growth and development as a result of the movement of the university. Figure 4 shows the changes in land uses of the area between 2005 and 2012 respectively. Figure 5 shows the detailed digitized physical developments in the area as at 2012.

Figure 4: Variation in Land uses of the area between 2005 and 2012



Source: Urban and Regional Planning Department, FUT, Minna

Figure 5: Digitized physical developments in GidanKwano as at 2012



Source: Urban and Regional Planning Department, FUT, Minna

***The Impacts of Federal University of Technology, Minna on the Physical Development of GidanKwano***

The results of the analysis and findings show that developments have occurred as a result of the movement of the university to its permanent site since 2005 and these are enumerated below;

- i. Physical expansion of the village.
- ii. Increase in population of the residents.

- iii. Construction of more residential and habitable housing units for students and staff.
- iv. Provision of infrastructural facilities to support the growing population.
- v. Increase in investments on landed properties.
- vi. Corporate social responsibility of the university in the provision of bore hole and overhead water tank to the host community as well as employment of various categories of the indigenes (the skilled, semi-skilled and the unskilled).
- vii. Opportunity for indigenous farmers to sell their farm produce to students and staff of Federal University of Technology, Minna there improving their economic development.
- viii. Co-existence and social integration of the people despite differences in ethnicity and language. Despite the above positive impacts of the university on the host community, there are noticeable negative impacts which include;
- ix. Ecological foot print on the host community - Gradual loss of green areas to man made improvements
- x. Increase in urban heat
- xi. Threat and insecurity as a result of lack of police post and security personnel.
- xii. Non enforcement of planning laws and regulations resulting in haphazard development of the area.

## 5. Conclusion

The paper has revealed the impact of university on the physical developments of the host community. It is expected that as the university grows in terms of programmes and admission, it will exert influence on the host community in terms of Real Estate and infrastructural development. It is however recommended that there is need for a planning policy for the study area to prevent haphazard developments and slum formation.

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