



**SCHOOL OF ENVIRONMENTAL TECHNOLOGY,
FEDERAL UNIVERSITY OF TECHNOLOGY**
MINNA, NIGER STATE, NIGERIA



4th

INTERNATIONAL CONFERENCE (SETIC2022)

BOOK OF PROCEEDINGS

MAIN THEME:

**SUSTAINABLE DEVELOPMENT AND RESILIENCE OF THE
BUILT ENVIRONMENT IN THE ERA OF PANDEMIC**

6th - 8th February, 2023

**VENUE: NITDA Centre,
Federal University of Technology,
Minna, Niger State, Nigeria**

Chief Host

Prof. Faruk Adamu Kuta

*Vice-Chancellor
Federal University of Technology Minna, Nigeria*

Host

Prof: R.E. Olagunju mnia

*Dean, School of Environmental Technology
Federal University of Technology Minna, Nigeria*

**EDITOR IN CHIEF
B.J. Olawuyi**





School of Environmental Technology International Conference (SETIC 2022)

6th – 8th February, 2023

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

BOOK OF PROCEEDINGS

**EDITOR IN CHIEF
B. J. Olawuyi**

ISBN 978-978-54580-8-4



**Proceedings of the 4th School of Environmental Technology International
Conference (SETIC 2022)**

Published by
School of Environmental Technology,
Federal University of Technology Minna.
PMB 65, Minna,
Niger State Nigeria.

© School of Environmental Technology, Federal University of Technology Minna 2023

ISBN 978-978-54580-8-4

Editor-in-chief:	Dr. Olawuyi, Babatunde James	Federal University of Technology Minna. Niger State, Nigeria
Editors:	Dr. Ogunbode, Ezekiel Babatunde	Federal University of Technology Minna. Niger State, Nigeria
	Surv. Adesina, Ekundayo A	Federal University of Technology Minna. Niger State, Nigeria
	Dr. Sule, Abass Iyanda	Federal University of Technology Minna. Niger State, Nigeria
	Dr. Ajayi Oluibukun Gbenga.	Namibia University of Science and Technology, Namibia
	Dr, Akande Olufemi K.	Department of Architecture, Federal University of Technology, Minna
	Mr. Morenikeji, Gbenga	Federal University of Technology Minna. Niger State, Nigeria
	Mr. Akande, Olaide S.	Department of Urban and Regional Planning, Federal University of Technology, Minna
	Mrs. Odine, Linda	Department of Quantity Surveying, Federal University of Technology, Minna
	Prof. James O.B. Rotimi	Massey University New Zealand
	Asst. Prof. Dodo Yakubu Aminu	Architectural Engineering Department, College of Engineering, Najran University, Najran, 66426, Kingdom of Saudi Arabia
	Dr. Renuka Thakore	Founder, Institute for Global Sustainable Futures, Progress through Partnership, UK

No responsibility is assumed by the Publisher for any injury and/or any damage to persons or properties as a matter of products liability, negligence or otherwise, or from any use or operation of any method, product, instruction, or idea contained in the material herein.

Copyright © 2023 by School of Environmental Technology, Federal University of Technology Minna, Nigeria. All rights reserved.

This publication is protected by Copyright and permission should be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise.



PREFACE

The 4th edition of School of Environmental Technology International Conference (SETIC2022) is organised by School of Environmental Technology, Federal University of Technology Minna, Nigeria. In collaboration with Massey University New Zealand, University of Namibia, Namibia, Department of Architectural Technology, Najran University, Saudi Arabia, Department of Civil Engineering, Stellenbosch University, Stellenbosch, South Africa and the Global Sustainable Futures, UK.

The main theme for this year conference is “**Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**” and is of interest to everyone going by the fact that housing is a necessity following only after food and clothing while living in crowded places and poor sanitation is a concern and possible cause of spread of diseases and occurrence of epidemic/pandemic. This promotes and encourage innovative and novelty for emerging property management strategies in a pandemic era; modern geospatial tools for epidemiology; architecture, resilience and healthy buildings in pandemic era; planning for sustainable resilient neighbourhoods and cities in COVID-19 era; sustainable and resilient cities; sustainable cost management of built environment projects in the era of covid-19; wellbeing and resilience of the built environment.

The responses from participants for this conference are overwhelming, well attended, and successful. The operation mode was virtual for all participants with presentations in mode Our participants are from various Universities and other sector across the globe, from countries like United Kingdom, New Zealand, Saudi Arabia, South Africa, Namibia, Ethiopia and Nigeria just to mention a few. Hence, this conference provides a good platform for professionals, academicians and researchers to widen their knowledge and approach on latest advances in research and innovation. Papers presented in this conference cover a wide spectrum of science, engineering and social sciences.

Finally, a note of thanks must go to SETIC 2022 Local Organizing Committee (LOC) for their remarkable dedication in making this conference a success. We hope the event will prove to be an inspiring experience to all committee members and participants.



ACKNOWLEDGEMENTS

The effort put together in achieving the success of SETIC 2022 is predicated on the feat of the previous three edition of School of Environmental Technology International Conference held in 2016, 2018 and 2021, respectively. The support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology, Dr. Renuka Thakore, Dr Dodo Y. A., Prof. James O.B. Rotimi and many other highly motivated people are highly appreciated.

It is also my privilege and honour to welcome you all, on behalf of the Local Organizing Committee (LOC) to the 4th edition of the Biennial School of Environmental International Conference (SETIC2022). This Conference which was earlier schedule for April, 2022 is holding now (6th to 8th February, 2023) due to the prolonged ASUU-FGN crisis which made our public Universities in Nigeria to be closed for over Eight Months. Our experience in the 3rd edition held in 2021 after the COVID-19 Pandemic has thought us on new ways of doing things with the Virtual Conferencing offering us a wider coverage, it is our hope that SETIC2022 will be an improvement on the Participants experience of opportunity available for global networking and interaction at Conferences via the Virtual mode of presentation.

The conference provides an international forum for researchers and professionals in the built environment and allied professions to address fundamental problems, challenges and prospects of **Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**. The conference is a platform where recognized best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. This 2022 edition of SETIC has listed in the program a Round Table Talk on on Housing Affordability Beyond COVID-19 with selected Speakers from across the globe available to do justice on the topic of discussion. Distinguished Conference participants, permit me to warmly welcome our Keynote:

- Dr. Ibrahim Idris, *Director Public health, State Ministry of Health, Niger State, Nigeria;*
- Dr. A.A. Bilau, *Lecturer and expert in Disaster Risk Management, Department of Building, Federal University of Technology, Minna, Nigeria and;*
- Dr. Yakubu Aminu Dodo, *Ass. Prof. Architecture Engineering Department, Faculty of Engineering, Najran University, Najran, Saudi Arabia;*

And the lead Discussants for the Round Table Talk:

- Prof. James O.B. Rotimi, *Professor of Construction Economics & Management, School of Built Environment, College of Sciences, Massey University of New Zealand;*
- Prof. O.A. Kemiki, *Professor of Estate Management and Valuation, Federal University of Technology, Minna, Nigeria;*
- Dr. Renuka Thakore, *Founder, Institute for Global Sustainable Futures, Progress through Partnership, UK;*
- Dr. Guillermo Delgado, *Senior Lecturer, Architecture and Acting Director, Institute of Land, Livelihoods and Housing (ILIH), Namibia University of Science and Technology, Namibia;*
- Prof. Adewumi John Babafemi, *Associate Professor and Head of Construction Materials and Unit; Stellenbosch University, Stellenbosch, South Africa;*
- Dr. Yakubu Aminu Dodo, *Ass. Prof. Architecture Engineering Department, Faculty of Engineering, Najran University, Najran, Saudi Arabia.*



for accepting to share from their knowledge, wealth of experience and be available to interact with participants on varied issues on “**Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**”.

As reflected on the Conference program, the Conference activities will be Virtual for all presenters to run in four parallel sessions on the Zoon platform. With a total of Seventy (70) articles captured in the Conference Proceedings covering the six subthemes of the Conference, I have no doubt that we are all in for an impactful experience at SETIC2022 as we brainstorm, exchange ideas, share knowledge and participate in evolving more approach to sustainable housing and land management drives.

I implore us all to enjoy every moment of the deliberations and ensure we maximize the great opportunity offered by the Conference to network for better research and career development as we also make new friends.

I also on behalf of myself and the LOC express our appreciation to the Dean, School of Environmental Technology and the entire Staff of the School for giving us the opportunity to steer the ship for SETIC2022. To the Reviewers and various Committees that served with us, I say thank you for helping us through despite the pressure of work.

Thanks, and God bless you all.

Olawuyi, B.J. (PhD)
Chairman, LOC
SETIC2022



COPYRIGHT STATEMENT

© Copyright. School of Environment International Conference (SETIC2022). The copyright for papers published in the SETIC Conference Proceedings belongs to authors of the papers.

Authors are allowed to reproduce and distribute the exact format of papers published in the SETIC2022 Conference Proceedings for personal and educational purposes without written permission but with a citation to this source. No unauthorized reproduction or distribution, in whole or in part, of work published in the SETIC2022 Conference Proceedings by persons other than authors is allowed without the written permission of authors or organizers of the SETIC2022 Conference.

We have taken all necessary cautions to comply with copyright obligations. We make no warranties or representations that material contained in the papers written by authors do not infringe the intellectual property rights of any person anywhere in the world. We do not encourage, support or permit infringement of copyrights / intellectual property rights by authors. Should you consider any violation of your copyrights please do not hesitate to contact the conference secretariat at setic@futminna.edu.ng

SETIC2022 accepts no liability for copyright infringements or inappropriate use of material in any paper published. All authors developed their papers in line with the guiding principles of academic freedom and are responsible for good academic practice when conducting and reporting scientific research.

Correspondence relating to copyrights and requests for permission to use material from the SETIC2022 Conference Proceedings should be made to: Secretariat of SETIC Conference email: setic@futminna.edu.ng



DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

6th February, 2023

TO WHOM IT MAY CONCERN

I wish to state that all the papers published in SETIC2022 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, 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 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

Babatunde James OLAWUYI
Chairman SETIC2022
Federal University of Technology, Minna, Nigeria

Papers in the SETIC2022 Conference Proceedings are published on www.futminna.edu.ng,
AND ALSO SELECTED PAPERS WILL BE PUBLISHED IN REPUTABLE JOURNALS





ORGANISING COMMITTEE

CHIEF HOST

Prof. Faruq Adamu Kuta
Vice-Chancellor,
Federal University of Technology Minna, Nigeria

HOST

Prof. Olagunju Remi Ebenezer
Dean
School of Environmental Technology,
Federal University of Technology Minna, Nigeria

CONFERENCE CHAIRS

Conference Chair	Parallel Sessions
Prof. Nuhu, M.B.	Emerging Property Management Strategies in a Pandemic Era
Prof. Junaid, A	Planning for Sustainable Resilient Neighbourhoods and Cities in Pandemic Era
Dr. Opaluwa, Y.D.	Modern Geospatial Tools for Epidemiology
Dr. Anifowose, M. O.	Sustainable Cost Management of the Built Environment Projects in the Era of Pandemic
Dr. Olatomiwa, Lanre	Wellbeing and Resilience of the Built Environment
Prof. Ayuba, P.	Architecture, Resilience and Healthy Buildings in Pandemic Era

CONFERENCE ADVISORY COMMITTEE

Dr. Isah, A. D	HOD, Department of Architecture
Dr., Apeh, J. A.	HOD, Department of Building
Dr. Popoola, N. I	HOD, Department of Estate Management and Valuation
Dr. Mohammed Y.	HOD, Department of Quantity Surveying
Prof. Musa A.	HOD, Department of Surveying and Geoinformatics
Dr. Bala Banki	HOD, Department of Urban and Regional planning



LOCAL ORGANIZING COMMITTEE

Dr. Olawuyi B. J.	Chairman	Department of Building, Federal University of Technology Minna, Nigeria
Surv. Adesina E. A.	Secretary	Department of Surveying and Geoinformatics, Federal University of Technology Minna, Nigeria
Dr. Muhammad I.B.	Member	Deputy Dean, School of Environmental Technology, Federal University of Technology, Minna
Dr. Ogunbode E. B.	Member	Department of Building, Federal University of Technology Minna, Nigeria
Dr. Sule A. I.	Member	Department of Estate Management and Valuation, Federal University of Technology Minna, Nigeria
Dr. Ajayi O. G.	Member	Namibia University of Science and Technology, Namibia
Mr. Morenikeji G.	Member	Department of Estate Management and Valuation, Federal University of Technology Minna, Nigeria
Mrs. Odine L.	Member	Department of Quantity Surveying, Federal University of Technology Minna, Nigeria
Mr. Akande O. S	Member	Urban and Regional planning, Federal University of Technology Minna, Nigeria
Dr. Akande O. K	Member	Department of Architecture, Federal University of Technology Minna, Nigeria
Dr. Saidu I.	Member	Department of Quantity Surveying, Federal University of Technology Minna, Nigeria

SCIENTIFIC COMMITTEE

Prof. Jimoh R.A..	Chairman	Department of Building, Federal University of Technology Minna, Nigeria
Dr Opaluwa Y.D.	Member	Department of Surveying and Geoinformatics, Federal University of Technology Minna, Nigeria
Dr. Musa D. Haruna	Member	Urban and Regional planning, Federal University of Technology Minna, Nigeria
Dr. Udoekanem N. B.	Member	Department of Estate Management and Valuation, Federal University of Technology Minna, Nigeria
Dr. Lawal L.A.	Member	Department of Architecture, Federal University of Technology
Miss Nmadu H.	Member	Department of Building, Federal University of Technology Minna, Nigeria
Miss. Hassan K.M.	Member	Department of Quantity Surveying, Federal University of Technology Minna, Nigeria
Mr. Kuma S. S.	Secretary	Department of Estate Management and Valuation, Federal University of Technology Minna, Nigeria



A	SUB-THEME 1: EMERGING PROPERTY MANAGEMENT STRATEGIES IN A PANDEMIC ERA	1
1	Property Management Strategies in the Post COVID 19 Pandemic Era in Nigeria: Moving Beyond the Myths and Misconceptions	Ankeli, I. A., Salihu, N., Nuhu, M. B., Sule, I. A., Tinufa, A. A. 2
2	Developers Compliance with Urban Residential Development Control Measures in Kaduna Metropolis, Nigeria	Salihu, N., Ankeli, I. A., Nuhu, M. B., Sanni, M. L., Sule, I. A., Aliyu, A. A. Gwamna S. E., & Hamza, U. Y. 10
3	Macro Economic Determinants of Rental Values of commercial Real Estate in Ilorin, Nigeria	Abdulmalik, F.B. & Udoekanem, N.B. 18
4	Real Property Management in the Era of COVID-19 Pandemic in Nigeria: Promoting Real Estate Investment Trust as an Investment Vehicle	Bokani, A.M., Ahmad, M. & Suleiman, B.Y. 27
5	Assessment of Property Management Practices During and After Covid-19 Pandemic in Lagos, Nigeria	Ogungbe, M.A., Akinwamide, D.O. & Jejelola, O.F. 39
6	An Assessment of Valuation Accuracy in the Residential Property Markets in Minna and Abuja	Dangana, U.S., Udoekanem, N.B. 50
7	Biosensor Re-design requirements for Operational Facility Management in the Post-COVID workplace	Ataguba, J.O. 60
8	An Assessment of the Effect of Coastal Externalities on Residential Housing Prices in Badore, Lagos-Nigeria	Ayoola, A.B. & Akande, S.O. 73
9	Commercial Property Market Performance and Macroeconomic Indicators Amid COVID-19 in Lagos: The Causal Linkage	Wahab, M.B., Alalade, O. & Hassan, O.A. 83
10	Factors Affecting Real Estate Project Delivery and Housing Affordability in Abuja	Emokpaire, E. & Mohammed, M. 94
B	SUB-THEME 2: MODERN GEOSPATIAL TOOLS FOR EPIDEMIOLOGY	100
11	GIS Based Land Suitability Analysis for Optimal Choice of Cereal Crops Production in Kaduna State	Abdulraheem, S. & Opaluwa, Y.D. 101
12	Review on Depth Determination Bathymetry Using Remote Sensing Technique- Theoretical Appraisal	Adeleke. A., Nwadiolor I. J., Odumosu, J., Baba.M. & Bako. M 107
13	Assessment of the Hydrological Characteristics of Shiroro Dam, Nigeria	Adesina E. A., Musa A., Onuigbo, I.C., & Adesiji, A. R. 115
14	Remote Sensing and GIS-Based Vulnerabilities Assessment Over Borno State	Attahiru, I.M. & Etim, E.E. 123
15	Drought Analysis in Jega Local Government, Kebbi State, Using Geospatial Tools to Analyse Vegetation Covers	Yahaya, I. A. & Etim E. E. 132
16	Flood Vulnerability Mapping of Communities Along River Kaduna in Lavun Local Government Area, Nigeria	Mohammed, A.B. Y. & Onuigbo, I.C. 139
17	Analysis of Urban Growth Monitoring and Indicator-Based Assessment Using Remote Sensing Technique in Abuja Nigeria	Umar, I.A. & Etim, E.E. 147
18	Estimation of Leaf Area Index using geospatial methods-A review	Oleh, T. C. & Ajayi, O.G. 155
19	Assessment of Climate Change Impact and Population Growth on Concrete Bridges in Minna, Niger State Using GNSS Technology	Ladan, M.D. & Etim, E. E. 168
20	Image Fusion for Improving Spatial Resolution of Multispectral Satellite Images	Gobir, M. O. & Etim, E. E. 177
21	Point and Spatial Evaluation of Some Selected Commercial Software Used in UAV Image Processing	Aliyu, K. A. & Nwadiolor, I. J. 178
C	SUB-THEME 3: ARCHITECTURE, RESILIENCE AND HEALTHY BUILDINGS IN PANDEMIC ERA	186
22	Nigerian Prisons Reformation! Panacea for Reduction of Recidivism - Case Study of Minna Medium Security Prison	Abdul, C. I., Ekule, A. A., Idachaba, M. K., Nuhu, A. A. 187
23	Incorporating Principles of Adaptability in Spatial Configuration to Enhance Spatial Requirement in the Design of General Hospital Suleja, Niger State	Isiaka, A.S., Maina, J.J., Salihu, M.M., Saliu, O.H. 194



24	Ascertaining Daylighting Wastage in the College of Engineering Complex, Najran University, Saudi Arabia	Bal-Harith, H.M., Abdul Karim, A.N., Alotaibi, B.S., Abuhussain, M.A., Qahtan, A.M. & Dodo, Y.A.	213
25	Evaluation of Daylighting Conditions in Public Libraries: A Case Study of Kaduna, Nigeria	Ojobo, H., Tachio, A., Boyle, G.M. & Chindo, M.	220
D	SUB-THEME 4: PLANNING FOR SUSTAINABLE RESILIENT NEIGHBOURHOODS AND CITIES IN COVID-19 ERA		228
26	GIS-Based Approach to Small Hydropower Potential Assessment Along River Ogun, Nigeria	Akande, S.O., Sanusi, Y.A., Sanni, L.M., Idris-Nda, A. & Santali, B.N.	229
27	Analysis of Women Benefits from Participation in Social Networks in Gulu Vatsa Area of Niger State	Martins V. I. & Tsado E. S.	240
28	Socio-Economic Characteristics of Slum and Informal Settlement in Akure, Ondo State, Nigeria	Adedeji A.A., Junaid, A.M. & Sanni L.M.	246
29	Impact of protest in Lagos state as an emerging mega city: A Review	Malik, A.A. & Bilau, A.A.	252
30	Performance Analysis of Railway Transportation Services on Abuja – Kaduna Route, Nigeria	O’odoh, B. A., Owoeye, I. O, Busari, A. O., Shehu, M., Haruna, A. M., Adamu, H. N.	262
31	An Investigation into the Satisfaction Level of Student Accommodation in Students’ Living Environment of Modibbo Adama University of Technology, Yola, Nigeria	Ekule, A. A., Abdul, C. I., Idachaba, M. K. & Nuhu, A. A.	268
32	Bus Stop Location Considering Passengers Waiting Time and Cost	Ojidoh, C., Mohammed S. & Hawawu, A.	275
33	Evaluation of the Impact of COVID-19 on Public Construction Project Delivery in Nigeria- a Review on Literature	Balogun, M. O. & Bilau, A. A.	284
34	Appraising Household’s Sewage Management Practices in Samaru-Zaria, Kaduna State, Nigeria	Habila, S.K.1a, Itopa, W.I., Ode, I., Akan, M. & Lawal, H.	291
35	The Effect of Oil Spillage and Gas Pollution on Safety Health and Agricultural Production in Delta State	Adigwe, M.U. & Okah, C.M.	300
36	Residential Location Choice: A Study of Household Preferences in Minna, Niger State, Nigeria	Santali, B.N.	308
37	Spatial Distribution Pattern of Public Water Access in Makurdi, Nigeria	Begha, M.C., Sanni, L.M.; Akande, S.O. & Aremu, R.	317
38	Assessment of Environmental Risks in Residential Housing Bosso Niger State.	Olakunle, D.O. & Junaid, S	327
39	Assessment of Environmental Implication of Final Municipal Solid Waste Dump Site in Ilorin, Kwara State, Nigeria	Yaqub, H. A. & Morenikeji, O.O.	332
40	Residents' Perceptions of Urban Green Spaces and Park Qualities in AMAC Abuja	Ugboh, R., Musa, H.D. & Ohadugha, C.B.	338
41	Environmental Impact of Automobile Workshop Activities on Soil Quality in Minna, Nigeria	Nagidi, B.O.; Morenikeji, O.O. & Abbas, Y.A.	346
E	SUB-THEME 5: SUSTAINABLE COST MANAGEMENT OF BUILT ENVIRONMENT PROJECTS IN THE ERA OF COVID-19		353
42	Impact of External Pressures on Adoption of BIM in Construction Organisations	Sani, S.N., Nasir, R.M., Abdullahi, A.M. & Jibril, U.S.	354
43	Assessment of Project Financing Options by Construction Micro, Small and Medium Enterprises in Nigerian Construction Industry	Yesufu, S.I., Musa-Haddary, Y.G., Gandu, J.Y., Abdullahi, I. & Momoh, N	364
44	Impact of Post-COVID Era on Contractors’ Managerial Capability towards Performance of Construction Projects in Abuja, Nigeria	Zubair, A	373
45	Performance of Housing Cooperatives Societies in Housing Finance in North Western Geo-Political Zone, Nigeria	Aliyu, A. & Ganiyu, B. O.	387
46	Influence of Risk Factors on Transnational Public Private Partnership Cost Performance	Waziri, A., Musa, M & Faruq, I.	395



47	Evaluating the Level of Adoption of Total Quality Management (TQM) Practices in Quantity Surveying Firms (QSFs) in Kaduna State, Nigeria	Kure, B. A., Alumbugu, P. O. & Mohammed, Y. D.	414
48	SUB-THEME 6: WELLBEING AND RESILIENCE OF THE BUILT ENVIRONMENT		427
49	Compressive Strength of Millet Husk Ash as Alternative to Silica Fume in Internally Cured High Performance Concrete	Onogwu, C.M., Apeh, J.A., Olawuyi, B.J. & Okoh, B. O.	429
50	Comparative Study on Rice Husk Ash and Silica Fume as Supplementary Cementitious Material in High Performance Concrete Production	Okoh, B.O., Olawuyi, B.O. & Onogwu, C.M.	436
51	Development of Scheffe’s Regression Model to Predict the Compressive Strength of Concrete Using Metakaolin as Partial Replacement of Cement	Jegede, A., Adejumo, T. W., Oritola, S. F., Shehu, M., Omojah, A., Mahmud, M. B.	443
52	Effect of Vibration on Static and Dynamic Response of Loaded Waffle Slab	Abanda, M. A., Sadiku, S. S., Mohammed, A. & Aguwa, J. I.	450
53	Optimum Particle Size of Calcium Carbide Residue Required for Effective Soil Stabilization Using Zeolite for Road Construction	Yahaya, A. U., Alhaji, M. M., Aguwa, J. I., Shehu, M., Kabiru, U. D., Mahmud, M.B.	457
54	Assessment of the Performance of Sandcrete Blocks Produced by Partially Replacing Sand with Coal Bottom Ash as a Fine Aggregate	Ojutiku, M. O., Sadiku, S., Oritola, S. F., Shehu, M., Oglekwu, F. O., Adamu, H. N.	464
55	Biogenic Possibilities of Improving Mortar Strength Using Effective Microorganisms	Olukotun, N., Abdul, C.I., Ekule, A. & Abdullahi, N.A.	469
56	Microstructure and Sorption Properties of Alkaline Surface Modified Coir Bio Fibre	Kure, M.A., Olawuyi, B.J., Ogunbode, E.O. & Apeh, J.A.	475
57	Nanotechnology Application in the Development of Fonio Husk Ash and Calcium Carbide Waste Based-Binder Mortar	Abeku, D. M., Olawuyi, B.J., Apeh, J. A., & Hassan I.O.	481
58	Investigating the Adoption Level of Building Information Modelling for Post-Construction Management in Nigeria	Bello, O.Y. and Ayegba, C	490
59	A Study of the Productivity of Permanent Staff and Contract Staff for POP Workers and Tilers in Abuja	Agada, D.I. & Ayegba, C	500
60	An Investigation of the Satisfaction Level of Student Accommodation and Resilience of Students’ Living Environment of Modibbo Adama University of Technology, Yola, Nigeria	Ekule, A. A., Abdul, C. I., Idachaba, M. K. & Nuhu, A. A.	506
61	Prediction of Water Loss in Hydraulic Distribution System in Minna, Nigeria Using Artificial Neural Network	Yaba, T., Jimoh, O.D., Adesiji, A. R.	513
62	Particulate Matter Exposure of Passengers at Bus Stops	Inufin, T., Kolo, S. S., Jimoh, O. D.	520
63	Assessment of Quality Control of Tiles Production in West Africa Ceramics Company, Ajaokuta, Kogi State	Abdullahi, D., Lawal S. S. & Abdul, C. I.	529
64	Production of Pavement Blocks Using Low Density Polyethylene Product Waste	Aboje, A. A.; Abbas, B. A.; Kolo, D. N.; Abubakar, M. & Abdulsalam A. M.	540
65	Effect of Partial Replacement of Cement with Cow Dung Ash Using Bida Natural Coarse Aggregate	Abbas, B. A., Yusuf, A., Kolo, D. N., Aboje, A. A., Mahmyd, M. B. & Ndaiji, A. U.	547
66	Performance Evaluation of Cement-Stabilized Soft Clay Admixed with Coal Bottom Ash	Zubbair, M. A., Adejumo, T. E. & Amadi, A. A.	556
67	Beneficiation and Characterisation of Kaolin Clay from Clay Deposit in Kutigi, Niger State, Nigeria	Ogundipe, F.O., Saidu, M., Abdulkareem, A.S., and Busari, A.O.	564
68	Factors Contributing to Stress Among Construction Practitioners in Kaduna	Yusuf, I. and Ola-awo, A. W.	573
69	Design Measures for Health and Safety in Pre-Construction Stage of Public Building Projects in Nigeria	Adekunle, E.O., Alumbugu, P.O., Mohammed, Y.D.	582
70	Assessment of Building Standard in Health Care Facilities in Minna, Niger State, Nigeria	Yakubu, R., Sulyman, S.O. & Ohadugha, C.B.	591
71	Factors Affecting Small and Medium Construction Firms Profitability	Aliyu, M & Aola-awo, A.W.	599



A Study of the Productivity of Permanent Staff and Contract Staff for POP Workers and Tilers in Abuja

Agada, D.A.^{1a} & Ayegba, C.^{1a}

¹Federal University of Technology Minna, School of Environmental, Department of Building, Minna, Nigeria.

^aagadaid@gmail.com; ^bcalistus.ayegba@futminna.edu.ng

corresponding author: agadaid@gmail.com

Abstract:

Every country's GDP is greatly impacted by the construction industry (CI). However, concerns have been raised about the low productivity of the construction labor force during both the building and maintenance phases. Construction project's objectives could not be achieved unless labor productivity is raised. The aim of this research work is to study the productivity of Plaster of Paris (POP) workers and tilers for both permanent and contract staff within Abuja in order to advise appropriately the best staffing methods for such craft. Quantitative research methodology was applied with the use of time study to study the productivity of tilers and POP workers for both permanent and contract staff in 10 building sites in Abuja (5 sites for POP workers 5 for tilers). A total of 20 gang was studied for the purpose of this study. Each gang is made of two members. The results were analyzed using a simple arithmetic equation for calculating productivity. The results show mean productivity of the permanent staff POP workers is 1.108hrs/m² why that of the contract staff POP workers is 0.945hrs/m². The mean productivity of the permanent staff tiler is 1.043hrs/m² why that of the contract staff tiler is 0.871hrs/m². This implies that the productivity of contract staffs for both POP workers and tilers are better than that of their permanent staff counterparts. Contract staff is therefore advised for both POP activities and tiling activities in Abuja but this must be done without exploitation of the workers.

Keywords: Labour Productivity, Contract staff, Permanent staff, POP workers, tilers.

. Introduction

The construction industry is an important industry for the national economy of any nation as it provides space for other economic activities to take place. (Liu, 2008 and Rabia et al., 2020). The industry is labour intensive comprising physical (human) labour and mechanical (using machine) labour. This human labour usually refers to as labour productivity (Agbo& Ayegba, 2014). Labour productivity is defined as the relationship between output and input (Rao & Sudhanva, 2017; Agbo et al 2021). Labour productivity consist of about 30 -50% of the overall cost of project (Jakas & Bitu, 2012). Labour productivity determine to a greater extent the profit margin of contractors. Thus, increasing productivity is a crucial priority for any profit-oriented organization (Wilcox, 2000).

One of the key strategies for productivity increment is the quality of personnel. An organization with well qualified personnel has a higher chance of increased productivity (Gopal & Murali, 2015). This implies that in selection and recruitment of employee's emphasis should be on the quality of personnel being selected and recruited into the organization. The quantity and quality of the organization's production are directly impacted when low-quality workers are hired. Getting this quality employee depends so much on the method of recruitment and selection. In the 20th Century, emphasis was on permanent and pensionable employments system which has its disadvantage to the contractors and advantage to the employees (Agbo, 2014). However, in this 21st Century, emphasis has shifted from permanent and pensionable methods to contract and casual employment in the quest to reduce production cost and increase productivity (Mahesh et al., 2017).

Concept of Labour Productivity in Construction Industry

Jarosaw et al. (2019) develop a mathematical model of construction worker productivity. They did it by grouping 17 elements that influence the productivity of construction workers into five categories. Fuzzy logic was utilized to describe the factors mathematically. A formula for calculating construction worker productivity has been proposed. The authors' approach is unique in that it takes into account a variety of elements that have the ability to influence construction workers' productivity. A single assessment of ceiling formwork was conducted to demonstrate how the formula works. The validation



of a model demonstrated that it is capable of accurately analyzing, evaluating, and predicting the productivity of construction employees.

Salehi *et al.* (2013) investigated labour productivity issues using the nearest neighbor algorithm (NNA) to categorize things. To determine the value of items and standardize outputs, a multiple regression approach is utilized, accounting for the labour requirements for standard parts in each category as well as their production processes. A case study was given to verify the viability of the suggested technique. This technique has a number of advantages, including raising labour productivity, bolstering the production system, improving planning, and responding to market volatility.

Methods of Measuring Productivity

Isaac *et al.* (2015) claim that productivity metrics may be analyzed in terms of the entire range of production inputs, including labour as well as natural resources, intermediate commodities, and services. Average labour productivity (ALP), a single factor productivity metric, and total factor productivity, a multi-factor metric, are both used to quantify productivity. The output potential of a manufacturing process in proportion to its inputs is known as productivity (TFP). The impact of one input is measured by single factor productivity, but the influence of all inputs on output is measured by multi-factor or total factor productivity (labour). Tasks are specific construction operations including pouring concrete, installing tiling, and erecting structural steel. According to Isaac *et al.*, (2015) task-level productivity measurements are routinely used in the construction industry.

According to Attar *et al.* (2012), the majority of task-level productivity indicators are single factor measures that concentrate on labour productivity. According to Attar *et al.* (2012), contractors are frequently interested in the labour productivity at project sites, which can be categorized in one of two ways:

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Labour Cost}} \quad (1)$$

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Work-hour}} \quad (2)$$

The study also found that man-hours per unit (unit rate), which is the opposite of labour productivity, is frequently employed and that there is no universally recognized definition or measure of productivity.

Casual or Contract Staff

Employees whose services are contingent on the specific function or responsibility they were recruited to perform are referred to as "contract personnel." They are laid off when their 'contract' expires, and they can only be rehired if another job is available. The fact that their employment is not permanent is the greatest distinguishing feature of this group of workers (Badmus *et al*, 2020).

The word "casualization" refers to occupations that have a high degree of cyclical demand, such as port work, agricultural migratory labour, and other intermittent low-skilled jobs. Another form of involuntary servitude that lasts for a certain period of time is casualization. Labour abuse is pervasive in many Nigerian organizations. There are many instances of this, including low pay, wage and salary arrears systems, training, career progression, motivation, feeling of community, job satisfaction, and dehumanization of work and people. (Badmus *et al*, 2020).

Casualization is another term for temporary employment, which can be found in a variety of industries, including transnational, multinational, public, and private companies, as well as the informal sector. As Campbell and Brosnan (2004) point out, definitions of casual work are frequently a source of misunderstanding and debate, with contradictions between vernacular, regulatory, and contractual meanings.

Permanent or Full-Time Staff

When someone works for an employer and receives their pay directly from them, it is said that they are in a permanent employment relationship. With this kind of work arrangement, the end date is not



specified. Part-time or full-time employment, as defined by the Bureau of Labour Statistics as workweeks averaging 35 hours or more, are both options for permanent employees. Benefit packages are typically provided to permanent employees by their employers, though these packages can change depending on whether they work full- or part-time Indeed Editorial Team (2021).

Eight-hour days and 40-hour weeks are the standard for a full-time job, though this depends on the industry and position. The assumption of a five-day workweek varies based on the profession. Full-time employment is not specifically defined by the US Department of Labour; instead, it is up to individual businesses to do so. The idea of "business hours" or "9 to 5" employment gives people a common understanding of full-time employment. Monday through Friday, 9:00 a.m. to 5:00 p.m., are the typical office and corporate culture hours, while there may be some variance based on the company's culture and industry. There are no fixed requirements for when those hours must be completed; nonetheless, full-time employment demands a 40-hour workweek (or at least a schedule of at least 32 hours). Along with some degree of financial security, full-time employees typically get a variety of benefits as part of their employment agreement, such as paid time off (PTO), 401(k) plans, and insurance (Reshetnikova *et al.*, 2019).

Considering the various views and studies carried out in these areas so far it is obvious to note that though have being a change from the conventional permanent employment to temporary or contract employment there have being the difficulty of determining the most appropriate staffing methods for these two craft being considered in this research. From preliminary site investigation there have been so much divergent view about which is most appropriate for best productivity and yet not been involved in the 21st form of modern slavery. This necessitates this study to ascertain the most appropriate staffing methods for POP workers and tilers with the view of determine the most appropriate one within the FCT Abuja.

Methodology

The methodology used for collecting data in thus study was through the use of time study administered to POP workers and tilers of both permanent and contract staffs on site. This study was limited to ten building construction sites in Abuja. The gang size used for the purpose of this research for both POP workers and tilers is two. The total number of gangs studied is 20. In carrying out the time study, the following tools are used: a stopwatch, a plane sheet, a pencil, an eraser, clipboards, and a ruler.

Time: The researcher begins work at the site when it opens (7:30 am) and ends when it shuts (3:30 pm), or eight (8) working hours, depending on when the location is visited. In order to see well and to minimize interruptions while doing the study on location, the researcher finds a comfortable spot to sit a little distance from the subject of observation. The following information is included in the used paper:

- Type of work done
- Rating based on observation
- The start time for each type of work done
- The ending time for each type of work done
- The observed time
- The idle time
- The actual time
- Total area of work covered (Attar *et al.*, 2012)

When a job is interrupted, the duration of the interruption is noted as idle time. At the end of the day's work, the total amount of idle time is removed from the overall amount of time spent to give us the real amount of time used for that specific activity. By beginning the stop clock as soon as work begins, the observation process starts and is then continued. When work is interrupted, it was ensured that the



length of the interruption was precisely documented. This procedure was repeated for different gangs of POP workers and tilers on 10 selected sites (5 for POP worker and 5 for tilers) having both contract and permanent staff on site for 14 days on each site.

Results And Discussions

Table 1 shows the summary of the Labour productivity study carried out using the Time study for POP activity and Tilling activity which were either contract or permanent staff. This study was carried out on 5 building sites having both contract and permanent staff on site working on either tilling or POP work. Table 1 shows the expected mean productivity from each project and the actual mean productivity. It can be observed from table 1 that there is no consistency in the daily productivity of either contract or permanent staff of both the tilers and POP works and this can be caused by so many human factors and atmospheric factors such as; less idle time, the particular work load being assigned for the craft man to do for which he has the liberty to live after the work has been completed and duly inspected without having to wait for the official closing time, the psychological state of the craft man, the zeal to work on such day, weather conditions and many other factors which are being considered further at the course of this research.

The mean productivity of the permanent staff POP workers is 1.108hrs/m² why that of the contract staff POP workers is 0.945hrs/m², this shows that the permanent staff of POP workers takes 1.108hrs to complete one square meter of POP work why the contract staff takes 0.945hrs to complete the same areas of work, implying that the average productivity of the contract staff is better than that of the permanent staff since it takes the contract staff less time to complete the same square meter of the work.

Table 65: Summary result for labour productivity of POP Activity and Tilling Activity

POP Activity				
Project no.	Permanent staff		Contract staff	
	Expected productivity (hrs/m²)	Actual productivity (hrs/m²)	Expected productivity (hrs/m²)	Actual productivity (hrs/m²)
1.	1.235	1.106	1.235	0.961
2.	1.235	1.096	1.235	0.920
3.	1.235	1.031	1.235	0.893
4.	1.235	1.082	1.235	0.919
5.	1.235	1.224	1.235	1.033
Mean value		1.108		0.945

Tilling activity				
Project no.	Permanent staff		Contract staff	
	Expected productivity (hrs/m²)	Actual productivity (hrs/m²)	Expected productivity (hrs/m²)	Actual productivity (hrs/m²)
1.	1.108	1.009	1.108	0.864
2.	1.108	1.039	1.108	0.905
3.	1.108	1.146	1.108	0.875
4.	1.108	0.983	1.108	0.896
5.	1.108	1.039	1.108	0.817
Mean value		1.043		0.871

From Table 1, the mean productivity of the permanent staff tiler is 1.043hrs/m² why that of the contract staff tiler is 0.871hrs/m², this shows that the permanent staff tiler takes 1.043hrs to complete one square meter of tilling work why the contract staff takes 0.871hrs to complete the same areas of work, implying that the average productivity of the contract staff is better than that of the permanent staff since it takes the contract staff less time to complete the same square meter of the work. It can also be seen from table 1 that the mean productivity of both the tilling and POP activity is less than the expected productivity implying that the both productivity is ok in comparison to what is expected of such gang within Abuja.



Conclusions

The research objective was to study the labour productivity of permanent and contract staff productivity of POP workers and tilers in Abuja with the view to advise properly the best staffing method for those crafts on site. The study revealed that the productivity of contract staffs is better than that of permanent staff for both pop workers and tilers. The study therefore recommends contract staff for such craft work for better productivity. This must be done without undermining the workers wellbeing and profit also.

References

- Abdul-Rashid, K. & Hassan, S.F., 2005. Capability of a country’s construction industry to combat poverty: A case study on the OIC member countries, *Proceedings of the 4th MICRA Conference 2005*, 4-5.
- Abubakar, M., Ibrahim, Y.M., Kado, D. & Bala, K., (2014). Contractors' Perception of the Factors Affecting Building Information Modelling (BIM) Adoption in the Nigerian Construction Industry. *Computing in Civil and Building Engineering (2014)*, 167-178.
- Agbo A.E. and Ayegba C. (2014) Critical Factors Influencing Construction Labour Productivity in Carpentry and Steel Fixing in North Central Nigeria. *International Journal of Development and Sustainability*. 3(8) 1675-1684.
- Agbo, E. A., Izam, Y. D., and Ayegba, C. (2021). “Quantifying the Impact of Work Environment Factors on Variability of Labour Productivity in Wall Plastering” *Journal of Construction in Developing Countries (JCDC) EARLY VIEW*.
- Attar, A. A., Gupta, A. K., & Desai, D. BD. B. (2012). “A study of various factors affecting labour productivity and methods to improve it”, *Journal of Mechanical and Civil Engineering*. 2 (2),11–14.
- Badmus, B. G., Oladiran, A. & Badmus A. T. (2020), “Modernisation or Modern Slavery: The Concept of Casual/Contract Labour and the Dilemma of Economic Growth in Nigeria”, *ARC Journal of Addiction*, 4 (2),17-33.
- Campbell, I. & Brosnan, S. (2004). *Casual work and Casualization: Labour and Industry*. Centre for workplace culture changes, Sydney.
- Fellows, R. F., & Liu, A. M. (2021). *Research methods for construction*. John Wiley & Sons.
- Gopal, T. S. R., & Murali, K. (2015). A critical review on factors influencing labour productivity in construction. *IOSR Journal of Mechanical and Civil Engineering*, 12(5), 47-51.
- Indeed, Editorial Team, (2021). Permanent Employment: Definition, Advantages and Differences from Other Employment Types. Indeed Career Guide. Feb, 2021. Retrieved from: <https://www.indeed.com/career-advice/finding-a-job/permanent-employment>.
- Isaac A. O, Kevin C. O, & Jovita N. N. (2015) “A Comparative Evaluation of Labour Productivity of Wall Plastering Activity Using Work study” *PM World Journal* 4 (5), 2 – 3.
- Jakas, A. M., & Bitu, C. G. (2012). Factors Affecting Construction Labour in Kuwait. *Journal of Construction Engineering and Management*. 138(7), 811-820.
- Jarosław M., Edyta P. & Michał J. (2019) “Formula for Determining the Construction Workers Productivity Including Environmental Factors” *Building Journals*, 9 (1), 240
- Liu, M. & Ballard, G., (2008). “Improving labour productivity through production control”, *Proceedings of the 6th Annual Conference of International Group for Lean Construction, Manchester, United Kingdom*. 657-666.
- Mahesh K.S, & Kassim Reshma (2017), “Factors Affecting Labour Productivity in Construction Industries”, *Imperial Journal of Interdisciplinary Research (IJIR)*, ISSN: 2454-1362, 3 (6),130-133
- Owolabi, O.S.B. & Olatunji, A.S., 2014. The Roles of Construction Professionals in the Nigeria’s Construction Industry. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 19(11), 5.
- Rabia Almamlook, Mohamed Bzizi, Maha Al-Kbisbeh, Tgarid Ali, & Ekbal Almajiri, (2020) Factors Affecting Labour Productivity in the Construction Industry, *American Journal of Environmental Science and Engineering*. 4 (2) 24-30.
- Rao, B. P., & Sudhanva, N. (2017). Micro and macro-level analysis of labour productivity. *International Journal of Civil Engineering and Technology*, 8(8), 500–507.
- Reshetnikova, I., Zotkina, N., & Gusarova, M. (2019). Selection of recruitment methods in construction organizations. In *MATEC Web of Conferences* (Vol. 265, p. 07009). EDP Sciences.
- Salehi, M, Shirouyehzad, H. & Dabestani, R. (2013) ‘Labour productivity measurement through classification and standardization of products’, *International Journals of Productivity and Quality Management*, 11(1), 57–72.



Wilcox, S., String fellow, B., Harris, R., & Martin, B. (2000). “Management and Productivity.” Transportation Research Board, Committee on Management and Productivity, Washington, DC.