

**ICSSD 2024 Programme and Book of Abstract**

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**DEPARTMENT OF PHYSICS**

*in collaboration with*

**DEPARTMENT OF ESTATE MANAGEMENT**

COLLEGE OF SCIENCE & TECHNOLOGY,  
COVENANT UNIVERSITY, OTA, NIGERIA

**Present**

**8<sup>th</sup>** International Conference  
on Science and Sustainable  
Development

**ICSSD 2024**

**Theme**

**SCIENCE AS A TOOL FOR  
CLIMATIC RESILIENCE AND  
ENERGY SUSTAINABILITY**

**Date**

**November 13 - 15, 2024**

**Venue**

Center for Research, Innovation and Discovery,  
Covenant University, Canaan Land, Ota, Nigeria



**Dr. David O. Oyedepo**  
Chancellor, Covenant University



**Prof. A. H. Adebayo**  
Vice-Chancellor, Covenant



**Prof. Timothy A. Anake**  
Dean, CST, Covenant University



**Prof. Mojisola R. Usikalu**  
Head, Department of Physics,  
Covenant University



**Dr. O. Oloke**  
Head, Department of Estate  
Management, Covenant University



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**ACKNOWLEDGMENT**

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Institute of Physics, London, United Kingdom

ICSSD National and International Reviewers

**ICSSD 2024 PROGRAMME OF EVENTS**

**VENUE: CST CONFERENCE ROOM**

**WEDNESDAY, 13<sup>TH</sup> NOVEMBER 2024**

Opening Ceremony		11 00 AM
Opening Prayer	Chaplain, C U	11:00AM
Introduction of Dignitaries	Mr. A. W. Ayara	11:05AM
Conference Chair Remarks	Dr. R. Sule	11:10 AM
HOD Physics Remarks	Prof. M. R. Usikalu	11:15 AM
Dean, CST Remarks	Prof.T. Anake	11:20 AM
Vice-Chancellor Remarks	Prof. A. H. Adebayo	11:30 AM
Citation of the Keynote Speaker	Prof. C. O. Iroham	11:45 AM
Keynote Speaker Speech 1	Prof. O. A. Ogunba	11:50 AM
Citation of the Keynote Speaker	Dr. G. E. Ejiga	12:35 PM
Keynote Speaker Speech 2	Prof. A. M. Mishra	12:38 PM
Announcement	Dr. S.A. Akinwumi	1: 10 PM
Vote of Thanks	Dr. O. Oloke	1:15 PM
Closing Prayer	Prof. C. Omonhinmin	1:20 PM
Cocktail/Interactions		1 :30 PM
First Technical Session		2:30-5:00 PM

**VENUE: CST CONFERENCE ROOM**

**THURSDAY, 14<sup>TH</sup> NOVEMBER 2024**

Opening Prayer	Prof. M. Akinyemi	11:00 AM
Introduction of Dignitaries	Dr. V. O. Keke	11:03 AM
HOD Estate Management Remarks	Dr. O. Oloke	11:05 AM
Citation of the Plenary Speaker	Dr. G. C. George	11: 10 AM
Plenary Speaker Speech 1: online	Prof. J.K.O. Asante	11:15 AM
Discussion	Prof. O. Ohunakin	11: 45 PM
Tea Break/ Interactions		12:05 PM
Second Technical Session		12:30-4:30 PM
Lunch Break/ Interactions		4:30-5:00 PM

**VENUE: CST CONFERENCE ROOM**

**FRIDAY, 15<sup>TH</sup> NOVEMBER 2024**

Opening Prayer	Mr. O. Oladapo	11:00 AM
Introduction of Dignitaries	Mr O. R. Jolayemi	11:03 AM
Citation of the Plenary Speaker	Dr. T. Arijaje	11: 10 AM
Plenary Speaker Speech	Prof. O. A. Kemiki	11:15 AM
Dean’s Closing Remarks	Prof. T. Anake	11:35 AM
HOD’s Closing Remarks	Prof. M. R. Usikalu	11:45 AM
Rapporteurs	Dr. O.C. Olawole	11:50 AM
Announcement	Dr. S.A. Akinwumi	12:00 PM
Vote of Thanks	Dr. T. A. Adagunodo	12:05 PM
Closing Prayer	Prof C. Ayedun	12:10 PM
Opening Prayer	Mr. O. Oladapo	11:00 AM

**MASTER OF CEREMONY**

Mr. W. A. Ayara  
 Dr. O. V. Keke  
 Dr O. R. Jolayemi

**Welcome Address by the Dean, College of Science and Technology, Prof. Timothy A. Anake, at the 8th International Conference on Science and Sustainable Development (ICSSD)**

The Chancellor, Vice-Chancellor, Keynote Speaker, and all other protocols duly observed: Ladies and gentlemen, distinguished guests and participants. It is my pleasure to welcome you to the 8th International Conference on Science and Sustainable Development (ICSSD), organised by the Physics and Estate Management departments, where we gather to explore the critical role of science in addressing two of humanity's most pressing challenges: climatic resilience and energy sustainability.

As we convene at Covenant University in the next three days, our world faces unprecedented threats from climate change, including rising temperatures, devastating natural disasters, and unpredictable weather patterns. The imperative to act is clear. Science offers us the tools, expertise, and innovative solutions to mitigate these impacts and create a sustainable future.

This conference brings together leading scientists, policymakers, industry experts, and thought leaders to share knowledge, expertise, and best practices. Over the next three days, discussions will be held around the latest climate research and modelling, renewable energy solutions and technologies, climate-resilient infrastructure and urban planning, sustainable development and green economy strategies, and international cooperation and policy frameworks.

At the end of this conference, we will foster collaboration and knowledge sharing among stakeholders, identify scalable solutions and policy recommendations, promote climate resilience and energy sustainability and inspire collective action towards a sustainable future. Furthermore, let us harness the power of science for climatic resilience, accelerate the transition to renewable energy, and build sustainable communities and economies.

I want to thank our keynote speaker, panellists, and participants for their contributions. Your expertise and insights will shape the discourse and inform actionable strategies.

To our sponsors and partners, thank you for your support. Your commitment to this cause is vital. As we embark on this journey, let us recognise the urgency of our task. Climate change demands immediate attention, and science offers us the tools to respond.

Thank you for joining us. I look forward to productive discussions, meaningful connections, and a shared commitment to a sustainable future.

## **Welcome Address from the Head, Physics Department, Covenant University**

The Chancellor and Chairman Board of Regents, Covenant University, Dr. David O. Oyedepo

Members of the Board of Regents, Covenant University

The Vice-Chancellor, Covenant University, Prof. Abiodun H. Adebayo

The Deputy Vice-Chancellor, Covenant University, Prof. Olujide A. Adekeye

The Registrar, Covenant University, Mrs. Regina Tobi-David

Other Principal Officers of Covenant University

The Keynote Speakers, Prof. Ajay K. Mishra, University of Western Cape, South Africa; Prof. Olusegun A. Ogunba, Obafemi, Awolowo University, Nigeria

The Plenary Speakers, Prof. Joseph K. O. Asante, Tshwane University of Technology, South Africa; Prof. Nimisha Vedanti, National Geophysical Research Institute, India.

All Participants

Gentlemen of the Press

Kings and Queens of Hebron

Ladies and Gentlemen

It is a tremendous honor to stand before you today to welcome you to the 8th edition of the International Conference on Science and Sustainable Development (ICSSD2024). ICSSD conference was conceived in 2016 with the main goal of creating a robust and excellent platform for cross-fertilisation of ideas among researchers and stakeholders that are concerned with sustainable development. It is also established with the belief that it would stimulate innovative research in Science and Technology, which will provide solutions to the numerous challenges such as poverty, food insecurity, unemployment, lack of potable water, power deficit, poor economic development, cybercrime, insecurity, corruption etc., which are also relevant to the realisation of the United Nation's Sustainable Development Goals (SDGs).

As we gather to commence this timely and impactful conference on the theme "Science as a Tool for Climatic Resilience & Energy Sustainability. The theme is not just a topic of academic interest; it is a call to action. Science, as we know, has always been at the core of our understanding of the natural world and our development of tools to meet its challenges. As we face the dual pressures of climate change and the global shift toward sustainable energy solutions, science stands out as our most powerful ally in building a resilient and sustainable future. The very essence of this conference is to explore how scientific innovation, research, and collaboration can pave the way for a world that is both climate-resilient and energy-secure.

This conference brings together diverse minds across various fields, from environmental science to engineering, policy studies to community advocacy all converging on this critical issue. In the days ahead, we will hear from leading experts who will share their groundbreaking research, innovative approaches, and success stories. We will delve into topics like renewable energy technologies, climate adaptation strategies, sustainable urban planning, and much more. Each session is an opportunity to learn, collaborate, and ignite new ideas that can lead to real-world



impact. We are here because we share a common purpose, one that transcends any single institution or individual: the drive to harness science to make a difference. The conversations we start here have the potential to shape policies, influence community practices, and inspire the next generation of scientists and innovators.

To our guest speakers, panellists, and participants, I encourage you all to engage fully, to share freely, and to challenge one another. Science thrives on diversity of thoughts and rigorous debates, and I am confident that this gathering will stimulate both. Let us use this conference not only as a platform to exchange knowledge but as a catalyst for forging partnerships that will help build a resilient future.

I am glad to inform you that the Conference received high number of quality technical papers which went through blinded peer-review process before acceptance, together with the contributions of the Keynote and Lead Speakers, we are confident that ICSSD2024 promises to be very stimulating and engaging. It is our belief that the communique that will arise from the various technical sessions and deliberations in ICSSD2024 will be useful to government, policymakers and stakeholders to drive the needed sustainable development in our nations and continent in general.

On behalf of the Organizing Committee, I wish to express our profound gratitude to Covenant University Management ably led by the Vice-Chancellor, Prof. A. H. Adebayo, for the support we have continued to receive in hosting and sustaining ICSSD on annual basis. We are equally grateful to the Centre for Research, Innovation and Discovery (CUCRID), Covenant University for their support for Conference, College of Science and Technology for making her facilities available for use during this Conference. We appreciate all the organisations, institutions and individuals that have continued to support ICSSD in one way or the other.

The hard work of the Organising Committee, led by Dr. Rasidi Sule, to ensure that this year conference is a huge success is noted. The efforts of the editorial team as well as our eminent and erudite reviewers of the technical papers submitted are duly appreciated. I wish you all an engaging and fruitful deliberation at this Conference.

Thank you all for your presence, your passion, and your commitment to this critical cause. It is my sincere hope that you leave here not only with new knowledge but with renewed inspiration to act, innovate, and make a lasting impact. Let us work together to shape a sustainable and resilient future.

Thank you and welcome to Hebron, the birthplace for Kings and Queens.

God bless you.

**Prof. Mojisola R. Usikalu**  
*Head, Physics Department*

**Opening Remarks from the Head, Estate Management Department, Covenant University**

The Chancellor and Chairman, Board of Regents, Dr. David O. Oyedepo

The Vice-Chancellor, Prof. Abiodun Humphrey Adebayo

The Deputy Vice Chancellor, Professor Olujide A. Adekeye

The Registrar, Mrs Regina Tobi-David

Dean, CST, Professor Timothy Anake

I count it a great privilege to address this August gathering at this year edition of the International Conference on Science and Sustainable Development tagged “Science as a Tool for Climatic Resilience and Energy Management”. The energy that the phenomenon has generated globally and the level of discourse that centers on prevention, mitigation and adaptive strategies at various national and international fora lend credence to the timeliness and appropriateness of the theme at this auspicious time in history. Virtually no day would be complete without a report of climate crisis or calamity somewhere on many international, national or local news outlet. Very recently, precisely August 2023, a wind-driven wildfire obliterated the Island of Maui, in the US state of Hawaii, destroying about 2,200 structures, killing 102 and causing an estimated \$5.5billion damages. A CNN weather report showed that an unprecedented 91 flash flood emergencies have been issued by the US National Weather Service this year alone more than any other year in history. In recent times, devastating flooding, resulting from hurricanes and rainstorms have swept through several US towns and cities such as New Mexico, North Carolina, Florida, Texas, New York, Connecticut just to mention a few, causing billions of Dollars damages to lives and property. In Nigeria, about 350 have lost their lives and 1.2million people affected/displaced by flooding in 31 states prominent amongst which are Edo, Delta, Anambra, Borno, Bayelsa, Ibadan and Lagos. Aside wildfire, hurricane, heavy rain and flooding, there are other manifestations of global warming such as extreme heat, drought, desertification, sea level rise, eruptions and most importantly food insecurity and energy crisis. We are all witnesses to what herders/farmers clashes in the north and southern parts of Nigeria has got the country into. More troubling however, is the fact that statistics of the climate change occurrences with its devastating consequences would only increase if we are not fast enough to arrest the phenomenon.

Since the occurrence has become inevitable and there is no other planet yet to escape to, it is just wisdom to develop capacity to either prevent, adapt or mitigate the impact of climate change.

And this could only be achieved through scientific research, discoveries and innovations. Science has helped the world in so many ways. especially in the fight against climate change, it has yielded certain level of breakthroughs. For instance, with the help of science, the driving force behind global warming has been identified. With the help of science, we have been able to monitor the melting glaciers, the fast depleting forest of the Amazon, and the receding lakes. Science has helped to predict and observe the formation, the strength and speed of hurricanes and stormy rainfall, With the help of science, we receive real time reports of climate crisis happening anywhere around the world. With the help of science, the concept of smart homes, smart cities, green building have emerged and brought about more efficient use of scarce resources. Science is leading the global effort towards divesting from fossil fuel and tapping into renewable energy sources on both domestic and industrial scale. Science has become the indispensable ally in the fight against climate change. So science has been engaged but it has not been optimized. The world is currently at the stage where the occurrence of climate events and attendant hazards outpace scientific solution outputs. Hence the need to do more and do it fast.

The ICSSD cardinal objective among others, is to provide the platform where practical solutions from scientific research are brought to the doorstep of the industry and the government. The conference also provides the opportunity for researchers to share ideas, network, collaborate and catch new insight in their respective areas of research interest. The forum therefore promotes wider engagement with like-minds and gives momentum to research efforts and output. I therefore will like you to maximize your participation at this conference by actively engaging in every session, pay rapt attention to the presentations, contribute very constructively, network and do well to crystalize new concept with other researchers before the conference is over. I must let you know that the whole world is counting and waiting on you. The Bible alluding to this in Romans 8:19 says *“For the earnest expectation of the creature waiteth for the manifestation of the sons of God”*.

Thank you and God bless you all.

**Dr. Olayinka C. OLOKE (ANIVS, RSV)**  
**Ag HoD, Estate Management**  
**Email: [yinka.oloke@covenantuniversity.edu.ng](mailto:yinka.oloke@covenantuniversity.edu.ng)**

## **Goodwill Message from Chair, Organizing Committee**

The Chancellor and Chairman, Board of Regents, Dr. David O. Oyedepo

The Vice-Chancellor, Prof. Abiodun Humphrey Adebayo

The Deputy Vice Chancellor, Professor Olujide A. Adekeye

The Registrar, Mrs Regina Tobi-David

Deans of Colleges

Directors

Eminent Professors

Head of Departments

Invited Guests

Faculties and Staff

Ladies and Gentlemen

It's my pleasure to welcome you to the official opening of the 8th Edition of the International Conference on Science and Sustainable Development (ICSSD 2024) with the theme Science as a tool for Climatic Resilience and Energy Sustainability. We are gathering today to address the two major problems that threatening our existence as human being which are climate change and energy crisis. The call for action against climate change can no longer be left for the developed nations as natural disasters such as flooding, drought, heat waves, wildfires, hurricanes and rising sea level costing both developed and developing nations billions of dollars every year. Also, the current global energy crisis has been attributed to increase in the utility cost and global energy demand has been projected to rise by nearly 50% by 2050. It is important we navigate our way out of these problems by developing resilience against the climate disruption and ensuring a sustainable energy future.

Science is the main tool for tackling the impact of climate change and energy sustainability by developing innovative solutions for a sustainable future. Scientific studies on climate risks and vulnerabilities provide policymakers and organizations with the pathway to build resilience against future climate disruptions. The advancement in scientific research has led to clean energy production which has reduced over dependent fossil fuel. However, a sustainable energy system is required to decentralize renewable energy and promote resilience in vulnerable power grids.

In these three days, we shall be exploring innovative approaches to climate resilience and energy sustainability from different scientific disciplines.

I would encourage you to maximize these three days by attending the plenary section and the technical section with rapt attention in order to achieve the aim of this conference. With our collective efforts on innovative research in science and technology, we would be able to build a resilience and sustainable future. It is important to mention that over 50 manuscripts have been peer reviewed and will be published in the Institute of Physics conference proceedings.

I would like to appreciate the management of Covenant University led by the Vice Chancellor Prof. Abiodun H. Adebayo for their support. My sincere thanks to the local organising committee of ICSSD 2024 for their efforts.

Feel free to establish a network and collaboration with other colleagues.

On behalf of the local organising committee of ICSSD 2024 I welcome you to this year's conference.

I wish you an exciting conference in Jesus' name.

God bless you.

**Dr. R. Sule**

*Chair, ICSSD2024*

**Lead Speaker**



**Professor Ajay Kumar Mishra  
MPhil, PhD, CSci, FRSC**

**Department of Chemistry, University of the Western  
Cape, Robert Sobukwe Road, Belleville 7535,  
South Africa.**

**NANO-ENGINEERED MATERIALS FOR ENVIRONMENTAL  
SUSTAINABILITY**

Nano-engineered materials have been used extensively for a variety of applications. Environmental pollution raised bigger concerns on the discharge of textile waste. Nanotechnology is fast growing on research and bringing sustainable solution in the minimization of the waste. The minimization of the risk of risk and health hazards with the development of industry, environmental pollution and energy shortages have raised awareness of a potential global crisis. Nano-engineered materials can be better solution in finding solution of environmental sustainability more specific to the textile waste remediation due to the large surface areas, diverse morphologies, abundant surface states, and easy device modeling. It is a challenge of great importance to identify and design nano-engineered materials that are efficient, stable, and abundant for the remediation of textile waste. The current talk will be focused on the recent advancement and applications of nano-engineered materials for environmental sustainability and future scenario.

## Keynote Speaker



**Professor Olusegun A. Ogunba**

**Department of Estate Management,  
Obafemi Awolowo University, Ile-Ife,  
Nigeria.**

### **SCIENCE AS A TOOL FOR CLIMATIC RESILIENCE AND ENERGY SUSTAINABILITY**

Of all the environmental problems facing the earth, climate change is major, because it affects many aspects of life on earth including: bad weather, (frequent storms, droughts, heatwaves), water scarcity (water droughts affect crops), sea level rise, threats to the of biodiversity survival, less predictable growing seasons and food shortages, major health threats from heat stress, and increases in the factors that keep people in poverty. Fossil fuels are by far the largest contributor to global climate change, accounting for 75 percent of global greenhouse gas emissions and nearly 90 percent of carbon dioxide emissions.

The response of the world to the concern on the deteriorating state of the human environment has been an increasing focus on how to develop sustainably. The concept ‘sustainable development’ was first defined by the 1987 Report of the World Commission on Environment and Development, (the Brundtland Report). Later came the 17 Sustainable Development Goals (SDGs), signed in September, 2015, by all 193 countries of the UN. This paper focuses on two of the SDGs, that is, goals 7 and 13. Sustainable development goal 13 calls for urgent action to combat climate change and its impacts. Goal 7 is focused on affordable and clean energy. Its target 7.2 aims at substantially increasing the share of renewable energy in the global energy mix by 2030, while its target 7.3 is to double the global rate of improvement in energy efficiency by 2030.

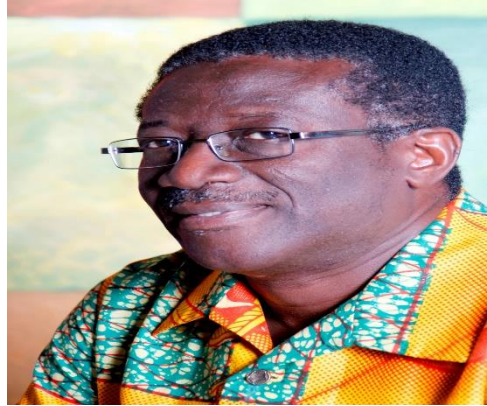
SDGs 13 and 7 call for climatic resilience and energy sustainability. Climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Energy sustainability is the practice of meeting the current energy needs of the world without compromising the ability of future generations to meet their own needs. Science is a key

tool for building resilience to climate change because it provides a systematic means of understanding the world around us, how it works, and how to solve its problems.

The background of this presentation is the built environment. The principal means by which built environment professions use science to address climate resilience is environmental impact assessments (EIAs)/environmental audits (EA), while the principal scientific means employed by built environment professions to address energy sustainability is green building. EIAs promote climate resilience through a systematic process of identification, prediction and evaluation of the negative environmental impacts of buildings, before development approval is granted for construction, so that anticipated negative impacts that exceed maximum permissible standards can be mitigated ab initio. However, the four-system operation of EIA in Nigeria is plagued with implementation difficulties. Green buildings promote energy sustainability at various stages of life cycle of buildings through use of green designs of Architects, and green building materials of Builders. However, there are very few green buildings in Nigeria, ostensibly because prospective developers are not aware of the degree to which they could gain lower costs-in-use and higher benefits from developing green buildings.

The paper concludes with a story of rats who needed to put a collar around a cat's neck to forewarn them of the cat's approach. The defining question was 'who would bell the cat?' The answer in the context of this presentation is: all built environment and other science/social science professions. Climate change is real and increasing; climatic resilience and energy sustainability must be a collective responsibility of every science profession. All science and social science professions are accordingly charged to take appropriate action.





**Professor Joseph K O. Asante**

**Department of Physics, Tshwane University of Technology, Pretoria,  
South Africa.**

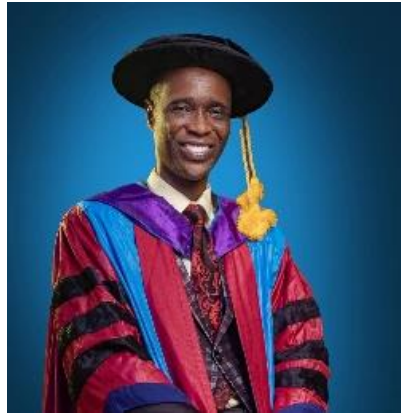
## **HEAT AND SMOKE SPREAD IN UNDERGROUND HYDRO-POWER STATION – VentSim VentFIRE SIMULATION**

The study investigated heat release rates and smoke spread behaviour in the underground cavern of a hydro power station using a VentSim VentFIRE simulation software. The fire simulation was based on the worst-case fire scenario of oil from a generator power transformer, rated 260 MVA (400/11 kV) and fuel load of 62 900 L (47 804 kg).

The geometric outlay of the cavern (150 m in the mountain) involves: Transformer Hall, the Main Access Tunnels, Ventilation Shafts, Adits, Machine Hall (housing turbines) and Valve Hall (linking Penstock Tunnels). A ventilation model was created in VentSim VentFIRE by applying the real dimensions of the underground hydro power station cavern as well as the thermochemical data of the transformer oil.

The observations were: in less than 3 min, visibility (due to smoke spread) in the Transformer Hall was less than 3 m; an instantaneous increase in airflow velocity, airflow volume and air pressure were observed upon ignition. Airflow velocity increased from 1 m/s to an average 13.5 m/s at the fire location while that of volumetric flow increased from (-) 40 m<sup>3</sup>/s to (-) 560 m<sup>3</sup>/s within the Main Ventilation shaft is observed. Within a minute, the fire generated a heat release rate of about 180 MW and persisted for over three hours, producing an average ceiling dry bulb temperature of 1 000°C above the transformer.

**Keywords:** Smoke spread, heat release rates, VentSim VentFIRE simulation software, underground hydro-power, transformer fire



**ESV. Prof. Kemiki Olurotimi Adebawale**

### **Biomaterials and Biocorrosion Study in Africa**

The overall human environment is a composition of natural and artificial features. Man's desire to transform his surroundings to suit his purpose and unique needs influences the degree to which he manipulates and designs his environment. The built environment is largely considered as human-made environment born out of experiences and technological innovations from fields actively involved in environmental engineering and construction. As technology evolves, man's interaction with his environment intensifies particularly in the quest to fulfill his desires regarding the satisfaction of his basic needs usually in the form of food, shelter and clothing. Common to the built environment are certain unpleasant situations which includes waste generation and pollution, exponential growth in population, poor infrastructure, insufficient housing, social vices and a whole lot of concerns. With the aid of literature, the paper evaluates these contemporary issues with a view to promoting innovative multidisciplinary research and practice among professionals in the built environment. The paper recommends that professionals should ensure strict adherence to environmentally-friendly policies which aim at ensuring sustainability, safety and resilience. Moreso, the need for experts to integrate advanced information technology as they collaborate is imperative in ensuring easy analysis and processing of spatial and non-spatial data in the built environment.

## Table of Abstracts

Title	Page
Efficiency Enhancement of Photovoltaic Cells using Anti-reflective Coating <i>A. E. Duke, A. T. Ayotunde, E. O. Echeweozo, O. Ayanbisi</i>	1
Construction of IOT-Based Indoor Environmental Quality Sensor: Implications Toward Human Health and Productivity <i>A. E. Duke, A. O. Sharon, E. O. Echeweozo, W. A. Ayara, J. B. Okpata</i>	2
Quantitative Analysis of Geomagnetic Indices Using Wavelet Power Spectrum <i>K.J. Bamidele, A.D. Adelaja, A.A. Kotoye, A.S. Ajose, F.C.Falayi, E.O. Falayi</i>	3
Modelling absorbed gamma radiation dose rate from 226Ra, 232Th, and 40K of recycled waste materials: analytical and machine learning approaches <i>Solomon OYEBISI, Monsuru Akinleye, Reuben Sani, Kehinde Oyeyemi</i>	3
Probiotics Potentials of Fermented Rice For Sustainable Health And Well-Being <i>O. C. Nwinyi and Z. G. Dango</i>	4
Structure-based Design, In-silico Studies of Coumarin Moieties as Sustainable Inhibitors of Diabetes Mellitus Type 2 <i>O T Opebiyi, G O Oduselu, T A Ogunnupebi, O F Elebiju, J A Adekoya, O O Ajani</i>	4
Comparing the Convergence Behavior of Different Inertia Weight Strategies Using Multi-Objective Particle Swarm Optimization <i>N.E. Udenwagu, A.A. Oni, A.A. Ezenwoke</i>	5
In vivo evaluation of plant extracts against common phytopathogenic fungi isolated from papaya <i>M. I. Oniha, A. O. Eni, O. O. Akinnola, E. A. Omonigbehin, B. E. Adegboye, O. S. Taiwo, O.A. Odetunmibi, S.O. Oyejide, M.O. Aina, P. O. Isibor and E.F. Ahuekwe</i>	6
Implementation of Energy-Efficient Smart Switch and Lighting System <i>M. R. Usikalu, S. C. Okogbue, E. I. Ogunwale</i>	7
Construction of a Portable Solar Power Supply For Home Appliance <i>Ayanbisi Oluwasegun, Emmanuel Oluwasegun Awolala, Toluwani Precious Ayodeji, Marvel Lola Akinyemi</i>	7
Background Gamma Radiation in Grazing Patch Lands and Earthen Fish Ponds in Iju-Gas-Pipeline, Ota, Nigeria <i>I. O. Babarimisa, M. R. Usikalu and M. Omeje</i>	8
In-vitro Antifungal Activity Of Leaf Extracts Of Chrysophyllum albidum, Celosia argentea and Bauhinia monandra Against Phytopathogenic Fungi Isolated from Carica papaya <i>M. I. Oniha, A. O. Eni, O. O. Akinnola, O.A. Odetunmibi, S.O. Oyejide, M.O. Aina, P. O. Isibor and E.F. Ahuekwe</i>	9

A Fine-Tuned GPT2 For Intelligent Auto Response System Using Contrived Email Transfer Learning <i>O. R. Sogunle, O. O Osofuye and A. A. Oni</i>	10
Modelling and Prediction of Path Loss using the ARIMA models at Ku-band in Lagos State, South Western Nigeria <i>T.E. Arijaje, T.V. Omotosho, A.P. Aizebeokhai, S. A. Akinwumi, K. D. Oyeyemi</i>	10
Qualitative Analysis of Background Radiation from 238U, 232Th and 40K in Selected Location in Ekiti State using Aeroradiometry Data. <i>R.O. Morakinyo, M.R. Usikalu, T.A. Adagunodo, O.F. Ojo, B.I.Babarimisa</i>	11
Synthesis of High Purity Mesoporous Silica Derived from Rice Husk for Solar Cell Applications U. E. James, R. Sule and O. A. Adegbite	12
Trichoderma: A Review of its Mechanisms of Action in Plant Disease Control <i>Olusola Luke Oyesola, Rosemary Tonjock Kinge, Olawole Odun Obembe</i>	13
Computational Analysis on Novel Niobium-Based Half-Heusler Alloy (NbIrSb) for Waste Heat Recycling Process <i>O.R. Jolayemi, C.O. Asemota, O.S. Abiodun, J.O. Emegha</i>	14
Mental Health Awareness Community Center For Generation Z in Bandung City Based on Recreational Therapy <i>Mohammad R. F. Nugraha, Savitri P. Ramadina and Deanawati I. Wasilah</i>	14
First-Principles investigation of the Structural, Electronic and Lattice Dynamics of <b>C(X = O, S, Se, Te)</b> Perovskites <i>O.R. Jolayemi, S.D. Tobin-West, U.G. Chukwu, M. Runde</i>	15
Construction of an Arduino Based Smart Energy Meter <i>S. A. Akinwumi, S. M. Braide, T. E. Arijaje and O. A. Akinwumi</i>	16
Cross-Species Transferability of Cowpea SSR Markers to <i>Vigna Radiata</i> (L.) (Mung Bean) And <i>Phaseolus Lunatus</i> (L.) (Lima Bean) <i>O. O. Obembe, I. Ogundipe, O. S. Aworunse, O. A. Oyatomi</i>	17
Development and Performance Evaluation of Portable water-cooling system using thermoelectric peltier modules <i>A. P. Adeniji, R. Sule, E. I. Ogunwale, W. A. Ayara</i>	18
Bottom-Up Strategies for Creating Sustainable Urban Settlements through Sustainable Real Estate Development Practices <i>A. Jogunola, K.B. Akinbola and N. Ajienkwo</i>	19
Impact of Industrialization on the Environment: Water Quality Index of Pharmaceutical Effluent Discharged in Ota, Ogun State, Nigeria	

<i>O.C Nwinyi, S.D Kayode-Afolayan, E.F Ahuekwe, O. Oziegbe C.A Omonhinmin</i>	20
Assessment of Strategies and Elements of Natural Ventilation Used in Selected Universities in South Western Nigeria <i>B. Aseyan, M. Babatunde, A. Shittu, S. Agboola</i>	20
Self-Healing Concrete (Bio-Concrete) Containing Limestone Powder: Strength and Durability Properties <i>O.G. Mark, K.J. Jolayemi, A.K Kamale</i>	21
Spatial and Sustainability Requirement in Shopping Mall Design: A Case Study of Novare Shopping Mall Abuja <i>Bukola Titilayo Oyeniran, Oludare Obaleye</i>	22
A Comparative Analysis of the Occupancy Rate of the Various Classes of Hotels in Ikeja, Lagos for Sustainable Returns <i>C. O. Iroham, U. A. Nwanosike, A. F. Adedotun, S. Munyemana, N. J. Osere</i>	23
Assessing Rental Loss in Vacancy of High-Rise Commercial Buildings in Marina, Lagos, Nigeria. <i>C. O. Iroham, M. I. Onyenze, A. F. Adedotun, S. Munyemana</i>	24
A Review of Challenges Influencing Stakeholders Engagement in Construction Project Delivery <i>M. A. Tor and J. E. Mamman</i>	25
Bibliometric Analysis of Literature on Smart Technology Integration in the Construction Industry <i>F.O. Adejola, L.M. Amusan, C. Aigbavboa</i>	26
Critical Success Factors towards the Adoption of Lean Practices (LPs) in the Nigerian Building Industry <i>O. Babalola, A. Akinola, S. Agboola, E. Adekunle</i>	27
Review of Petroleum Sludge Treatment methods and Utilization of Ash as an alternative Green Construction Material <i>S. David, C. M. Onogwu, O. J. Oladiran and S. A. Habu</i>	28
Effect of Lean Construction Practices on the Performance of TETFund Sponsored Construction Projects in Nigeria <i>F. A. Bolade-Oladepo, A. O. Ogunde, O. J. Oladiran and E. A. Olalekan</i>	28
Influence of Client Relationship Management (CRM) Process and Employee Support on the Retention of Architectural Clients <i>A.A. Adepeju, E.O. Ibem, A.A. Oluwatayo, A.O. Akinola</i>	29
Influence of Architectural Education on Sustainable Design Thinking: A Review of Energy-Efficiency Concepts.	

<i>A.B. Sholanke and C. Nwangwu</i>	30
A Study of Intellectual Property Valuation among Estate Surveyors and Valuers and Accountants in Southwest, Nigeria <i>A. S. Ibisola, C.A. Ayedun and O.C. Oloke</i>	30
Hedonic Pricing Model Analysis of the Effects of the Lapite Dumpsite on Residential Rental Values in Ibadan, Nigeria <i>M.A. Olukolajo and B.E. Akinwale</i>	31
An Evaluation of the level of awareness of sustainable design principles among architects in Lagos state, Nigeria <i>Akunnaya P. Opoko, Korede James, Vincent O. Ene</i>	32
Adoption of Passive Cooling strategies in selected Office buildings in Abuja, Nigeria <i>Adedapo A. Oluwatayo and Nduka Dike</i>	33
Healing Architecture in Women’s Healthcare Facilities in Lagos, Nigeria: A Sustainable Approach for Therapeutic and Environmental Benefits <i>O. D. Babalola and E. P. Sefia</i>	33
Exploring the dynamics of financial risk impact on property development in Lagos state, Nigeria <i>O. C. Oloke, P. J. Adenekan, C. K. Nwaniocha-Emegha, C. F. Nwanwko</i>	34
Climate Change and Space Weather; An Investigation of Coronal Mass Ejection and Cosmic Rays During Intense Geomagnetic Storms <i>Hammed Adeniyi Lawal, Edwin Beshel Ayabie, and Mukhtar Itopa Muhammed</i>	35
Analysis of Complex Relationship Between Earth’s Geophysical Reactions and Space Weather Occurrence (Seismic Activities) During the Solar Cycle 24 <i>Hammed Adeniyi Lawal, Isreal Leke Elijah, and Mukhtar Itopa Muhammed</i>	36
Optimal maintenance strategy for power transmission infrastructure <i>T. E. Somefun, P. Oluseyi, B. Babatunde, C.T. Somefun, O. M. Longe, I.A. Samuel, A.A. Awelewa</i>	36
Assessment of Anthropogenic Activities in Oyan Dam: Implication for Irrigation Agriculture <i>J. O. Akinyemi, A. M. Mobolaji, O. A. Odusanya, E.A. Olumomi</i>	37
Stabilization and Environmental Sustainability of Swelling Clays Soils: A Review <i>E. J. Oziegbe, O. Oziegbe and E. F. Ahuekwe</i>	38
Aeromagnetic Exploration for Delineation of Copper-Zinc in Azara, North Central Nigeria	

<i>G. C. George, R. C. Okereke, E. T. Ande</i>	39
Subsurface Characterization and Geo-Environmental Impact assessment of Opolo and Tombia using VES and Seismic Refraction techniques, south-southern Nigeria <i>G. C. George, I. D. Etu, E. O. Odokuma, E. Edeye</i>	39
Design Criteria for a Sustainable Power Supply in a Flood-Prone Area <i>Orovwode H. EI, Esisio E.F</i>	40
Application of source parameter imaging technique to the composite aeromagnetic data of Ekiti State for magnetic basement depth determination <i>O. F. Ojo, T. A. Adagunodo, K. D. Oyeyemi and E. G. Ejiga</i>	41
Thickness Estimation of The Dahomey Basin Around Ota and Environs Using Spectral Depth Analysis of Aeromagnetic Data <i>E. G. Ejiga, O. S. Antonio and O. F. Ojo</i>	41
Design and Implementation of a Solar-Powered Surveillance Drone <i>Amuta E.O., Orovwode H.E., Okoroji E.U, Attah A.R</i>	42
Feasibility Analysis of Hybridized Wind/PV Micro-grid for Telecoms Mast Using Energy Estimation Models and Homer <i>Olayinka Olaogun, P.A. Olubambi</i>	43
Sound absorption capacity of hot and warm asphaltic mixes modified with waste plastic bottles <i>Monsuru Akinleye, Solomon OYEBISI, Reuben Sani</i>	44
Sustainable Facilities Management Practice in a Volatile Economy (A Case Study of Cocoa House, Dugbe, Ibadan, Oyo State) <i>A.S. Ogunbodede</i>	44
Effect of Route Realignment of Electricity Wayleaves on Right Holders Affected in South-East, Nigeria <i>Chinaza Henry Obineme, Onyinye Vivian Keke, Raphael Oshiobugie Sado, and Olayinka Clement Oloke</i>	45
Climate Change and Food Security: Fresh Insights From Nigeria Using a Computable General Equilibrium Approach <i>Christiana O Hassan, Eyitemi A Fasanu, Oluwatoyin A Matthew, Tunde M Hassan</i>	46
Renewable Energy for Sustainable Development in Nigeria: Analysing Its Potential Impact on Land Use in Sokoto State	

- Gbenga Morenikeji and Michael Ayodele Olukolajo.* 46
- Sustainable Design Strategies for Upcycling Plastic Waste in Gumuruh Village through Service Learning  
*Friska Amalia, Andriano Simarmata, Iftika Suliastuti, Deanawati Insani Wasilah, and Bayu Edward Ramadhan Wardhani* 47
- Implementing Zero Waste Strategies in Biophilic Interior and Furniture Design Using Banana Frond Fibre  
*Friska Amalia, Asep Ahadiat Gandawijaya, Nahja Akbar Khalid, Iftika Suliastuti, Imanda Dea Sabiella, and Nitya Dhira Saccena* 48
- Eco-Driven Interior and Furniture Innovations for Braille Reading and Writing Accessibility in Inclusive Braille Libraries  
*Friska Amalia, Bayu Edward Ramadhan Wardhani, Deanawati Insani Wasilah, Andriano Simarmata and Savitri Putri Ramadhina* 48
- Transforming Bamboo Waste in Saung Angklung Udjo into Value-Added Products to Implementing The Zero Waste Principle: A Community Empowerment Initiative Collaboration with Virageawie Workshop.  
*Deanawati I. Wasilah, Seruni Kusumawardhani, Dipty M. Sabilla, Asep A. Gandawijaya, Artha Sanjaya, Asri Radhitanti, Nitya D. Saccena and Wiguna P. Abadi* 49
- Natural Disaster Mitigation Education Learning Design in Bandung with Interactive Simulation Design Application  
*Laura V. Kamara, Deanawati I. Wasilah<sup>2</sup> and Savitri P. Ramadhina* 50
- The Role of Li-Fi in Renewable Energy Applications: Opportunities and Innovations  
*Williams A. Ayara, and Kehinde D. Oyeyemi* 50
- Understanding the Relationship between Energy Efficiency, Institutional Strength and Nigeria's Economic Expansion  
*Oluwasogo S. Adediran, Oluwasegun A. Adekoya* 51



## APPLIED SCIENCES AND SUTAINABLE DEVELOPMENT

1

20248003S

**Efficiency Enhancement of Photovoltaic Cells using Anti-reflective Coating**A. E. Duke <sup>1\*</sup>, A. T. Ayotunde <sup>1</sup>, E. O. Echeweozo <sup>2</sup>, O. Ayanbisi<sup>1</sup><sup>1</sup>Department of Physics, Covenant University, Ota, Ogun State, Nigeria.<sup>2</sup>Department of Industrial and Medical Physics, David Umahi Federal University of Health Sciences, Uburu, Ebonyi State, Nigeria.Corresponding email: [archibong.duke@covenantuniversity.edu.ng](mailto:archibong.duke@covenantuniversity.edu.ng)

**Abstract.** The quest for sustainable energy solutions has brought photovoltaic (PV) technology to the forefront of renewable energy research. A critical challenge in PV technology is the reduction of reflective losses, which significantly impact the overall efficiency of solar cells. The aim of this work is to investigate the use of titanium dioxide (TiO<sub>2</sub>) as an anti-reflective coating to enhance the efficiency of photovoltaic cells. Titanium dioxide TiO<sub>2</sub> is chosen for its favourable optical properties, chemical stability, and cost-effectiveness. In this work, we applied TiO<sub>2</sub> on the surface of a monocrystalline solar panel using spray coating technique. The photovoltaic performance, including parameters such as Voltage (V) Power (W) Current (I) and overall conversion efficiency, was measured and compared to uncoated solar panels. Graphs plotted from the data obtained showed that the voltage and power rating of the panel coated with titanium dioxide TiO<sub>2</sub> operates at a higher voltage ranging from 24.3V to 25V and 26W to 36W compared to that of uncoated panel ranging from 21.7V to 22.3V and 22W to 30W. Efficiency calculations was done indicating the coated panel as 28.823% and uncoated as 24.520%. The results showed that TiO<sub>2</sub> anti-reflective coatings effectively enhance the performance of photovoltaic cells, making them a viable solution for increasing the efficiency of solar panels.

**Keywords:** Titanium dioxide TiO<sub>2</sub>, coating, anti – reflective, efficiency, solar panel.

2

20248004S

## Construction of IOT-Based Indoor Environmental Quality Sensor: Implications toward Human Health and Productivity

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**Abstract.** The IoT-based indoor air quality sensor which is designed to detect combustible gases, temperature and humidity in our environment, the gases are detected by the indoor air quality sensor and gives a report of a measure on whether the gases are too much or too low, which could be good or bad for the individual health who stay in such environment in order to prevent what we call SBS which include facial skin symptom, irritation of the nose, throat, and eyes, breathing difficulty, tiredness, headaches, cancer, respiratory disorders, and weariness. These sensations may be uncomfortable and upsetting. This indoor air quality sensor helps to increase productivity in places such as homes and offices. The system was designed using a microcontroller coupled with drivers, regulated power supply, components such as DHT22 w, MQ135, Sd card Module, Sd card, 32Gb, ESP8266, LDR, LCD, which work together and gives feedback. The device sensor is user-friendly and portable, requires low maintenance, and it enables real-time, continuous monitoring.

**Keywords:** Air quality, indoor, sensor, microcontroller coupled, humidity.

3

20248005S

## QUANTITATIVE ANALYSIS OF GEOMAGNETIC INDICES USING WAVELET POWER SPECTRUM

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**Abstract.** The wavelet power spectrum (WPS) was used to analysis the geomagnetic indices (Eastward Asymmetry Magnetic Field, ASY –D, Horizontal Asymmetry Magnetic Field – ASY –H, Eastward Symmetry Magnetic Field, SYM – D and Horizontal Symmetry Magnetic Field SYM –H). Sourced from the Flight Center Space Physics Data Facility (GSFC/SPDF) OMNIWEB, the one-minute dataset was applied spanning from 1st January to 31st December, 2014 during the solar maximum. The WPS of the geomagnetic indices displays the certainty of the temporary variations throughout the geomagnetic storm period. There is variation in the enhancement of the geomagnetic storm from month to month similarly there is fluctuation in the intensity of the occurred storms. This event can be attributed to coronal mass ejections for the period of high solar activity.

**Keywords:** Geomagnetic indices, Wavelet power spectrum, Magnetic field.

4

20248007S

## Modelling absorbed gamma radiation dose rate from <sup>226</sup>Ra, <sup>232</sup>Th, and <sup>40</sup>K of recycled waste materials: analytical and machine learning approaches

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**Abstract.** The potential health dangers connected with naturally occurring radioactive elements have sparked an interest in analyzing radionuclides of recycled waste materials. This study used published sources to obtain radionuclide datasets comprising activity concentrations (<sup>226</sup>Ra, <sup>232</sup>Th, and <sup>40</sup>K) of recycled agro-industrial waste materials. The concentrations were analyzed, generating absorbed gamma radiation dose rates (ADR). ADR was modelled in relation to <sup>226</sup>Ra, <sup>232</sup>Th, and <sup>40</sup>K by contrasting three machine learning (ML) techniques, including adaptive gradient boosting (AdaBoost), random forest regression (RFR), and long short-term memory

(LSTM). The results revealed that LSTM yielded the best performance metrics for predicting the ADR of recycled agroindustrial waste materials with correlation coefficient (R), mean absolute error (MAE), and weighted mean percentage absolute error (WMAPE) of 0.9998, 4.1174, and 0.0138 at training phase and 0.9990, 9.3692, and 0.0304 at testing phase. Predicting the ADR of recycled waste materials in relation to activity concentrations with the LSTM technique offers a strong, reliable, and accurate model.

**Keywords:** Gamma Radiation, Machine Learning, Radioactivity, Recycling, Waste Materials

5

20248008S

## PROBIOTICS POTENTIALS OF FERMENTED RICE FOR SUSTAINABLE HEALTH AND WELL-BEING

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**Abstract.** *Oryza sativa* (rice) is a major staple, cereal grain mainly consumed in most countries, especially for its nutritional content. Rice when fermented could serve as probiotics (functional food) with great health benefits. In fermented rice, lactic acid bacteria (LAB) have been reported to be a prominent microbial community. In this review, we made efforts to analyse the importance of fermented rice, the various types and ways of preparation, its probiotic potential, and possible future prospects as a functional food.

**Keywords:** Probiotics, Fermented Rice, Lactic acid Bacteria, Nutritional content.

6

20248010S

## Structure-based Design, In-silico Studies of Coumarin Moieties as Sustainable Inhibitors of Diabetes Mellitus Type 2

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**Abstract** The search for novel and more sustainable potent antidiabetic agents globally is due to the increase in insulin resistance, and more type 2 diabetes patients become susceptible to secondary complications. Many pharmacologically active compounds are organic, mostly heterocyclic compounds, accounting for about 85% of FDA-approved drugs for sustainable development. An example of a heterocyclic compound with therapeutic sustainability is coumarin, a benzopyrone group containing oxygen heteroatoms. Coumarin has been reported to possess several pharmacological properties, and combining coumarin with other compounds has made coumarin more potent. Computer-aided techniques have helped improve the design of potential drug candidates. Using computer-aided techniques, coumarin moieties were investigated for antidiabetic activities for future drug design. Coumarin template was used to search for ligand library on PubChem; 1653 compounds were downloaded alongside acarbose and metformin clinical standard in SDF format, 1632 compounds, acarbose and metformin were successfully prepared, and then docked against human pancreatic alpha-amylase (PDB ID: 4GQR) with Autodock vina. The qualitative structural assessment of the best hits from this molecular docking of a ligand library, acarbose and metformin was done. The functional groups present in this best hits, acarbose and metformin were used to generate 15 novel coumarin derivatives. The designed 2 compounds were also docked against 4GQR, and their ADMET studies were conducted. It was observed that 11 of the designed compounds had the lowest binding affinity than the cocrystallized ligand of 4GQR. The best hits compounds from the docking studies were 2g, 2f, 1a and 3e, and the ADMET studies predicted that compounds 1a, 3b, 3c and 3a had better pharmacokinetic and toxicity profiles. This promising result suggests that the designed compounds, particularly 1a, 3b, 3c and 3a, have the potential to be further optimized, synthesized and developed as potent antidiabetic agents, offering a hopeful future for sustainable treatment of diabetes.

**Keywords:** ADMET, Antidiabetic, sustainable science, Molecular docking, Type 2 diabetes

7

20248039S

## Comparing the Convergence Behavior of Different Inertia Weight Strategies Using Multi-Objective Particle Swarm Optimization

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**Abstract.** Particle Swarm Optimization (PSO) is a population-based optimization algorithm inspired by the social behavior of birds or fish schooling. PSO is widely adopted to solve continuous optimization problems due to its fast convergence qualities. However, it has a downside which makes it fall into local optima or premature convergence. As PSO continues to attract large research attention due to its computational advantages, choosing an appropriate inertia weight to improve its performance and solve the problem of premature convergence has remained a crucial challenge. This study compares the convergence behavior of different inertia weight strategies proposed in literature including, Exponential Inertia Weight (EIW), Constant Inertia Weight (CIW), Linearly Decreasing Inertia Weight (LDIW), Nonlinear Inertia Weight (NIW), Adaptive Inertia Weight (AIW), Chaotic Inertia Weight (CHIW) and Random Inertia Weight (RIW), in order to rank them according to their convergence behavior. In this study, all

the inertia weight strategies were implemented using a Multi-objective Particle Swarm Optimization (MOPSO) algorithm in a CloudAnalyst simulation environment using 805 cycles of 100 iterations each. The experimental results show that the CHIW inertia weight strategy has the best convergence capability with an average of 0.8 occurrences, followed by AIW with an average of 2.7 occurrences, among eight inertia weight strategies considered.

**Keywords:** cloud computing, Particle Swarm Optimization, inertia weight, Multi-objective.

8

20248040S

### **In vivo evaluation of plant extracts against common phytopathogenic fungi isolated from papaya**

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**Abstract.** Plants possess various efficacious natural products to curtailing various problems associated with man and his environment. Fungi cause significant postharvest losses to planetary papaya production, particularly in Africa. Current control methods focus primarily on synthetic fungicides that are hazardous to the environment, while plant-based fungicides are characterised with biofriendly and cost-effective potentials. In this study, three plant extracts were investigated for their in vivo antifungal activity against three phytopathogenic fungi isolated from *Carica papaya*. Aqueous extracts of *Moringa oleifera*, *Telfaira occidentalis* and *Bauhinia monandra* leaves were evaluated at concentrations of 150 mg/ml and 75 mg/ml for their antifungal properties in papaya fruits for 7 days. In vivo antifungal evaluation showed that the three plant extracts showed varying degrees of inhibitory activity against *Aspergillus niger*, *Aspergillus flavus* and *Rhizopus oryzae*. Of the three evaluated plants, *B. monandra* showed the highest antifungal activity during the post-inoculation period. The concentration of 150 mg/ml of aqueous extracts of the plants preserved the fruits and inhibited fungal growth in a range of 3-5 days, while the 75mg/ml concentration inhibited fungal growth for 3, 2 and 3 days after inoculation respectively. Significant weight loss was observed in fruits inoculated for both treatments and controls at both concentrations (p-value <0.05). This study has shown that the aqueous leaf extracts of *M. oleifera*, *T. occidentalis*, and *B. monandra* possess the potential as natural antifungals for the control and management of fungal diseases.

**Keywords:** Aqueous extracts, In vivo, *Moringa oleifera*, *Telfaira occidentalis*, *Bauhinia monandra*, Antifungal, *Carica papaya*

9

20248043S

## Implementation of Energy-Efficient Smart Switch and Lighting System

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**Abstract.** The growing demand for smart home systems underscores the need for improved security measures in controlling access to essential utilities. This project focuses on the development of a smart switch and socket system using the ESP8266 microcontroller and the Blynk application for wireless control. The primary objective is to design and implement a cost-effective system that ensures reliable remote control and monitoring of electrical devices. By integrating the ESP8266 with relay modules, the project aims to construct a functional prototype capable of managing device states and enabling power cut-off for safety, particularly in environments such as schools, to enhance child safety. The system is managed via the Blynk app, which facilitates efficient monitoring and control of various electrical loads. Through iterative testing, the system was evaluated for response times and power handling. Experiments demonstrated that the microcontroller's response times for turning on Relay 1 and turning off Relay 2 were 1.2 seconds and 1.1 seconds, respectively sufficient for real-time applications. The system also ensures automatic power cut-off when the load exceeds safe limits, enhancing safety and reliability.

**Keywords:** Smart Switch, Socket System, ESP8266, Blynk Application, Relay Mod

10

20248045S

## CONSTRUCTION OF A PORTABLE SOLAR POWER SUPPLY FOR HOME APPLIANCE

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**Abstract.** There has been a continuous increase in energy demand from environmentally friendly source such as solar energy. This has led to several innovations which are centred on developing sustainable, easily accessible, and portable power supply solutions. This project therefore aims to assemble and construct a portable solar power system for home appliances. It is of utmost importance to people in this part of the world (sub-Saharan African), because of the inconsistent power supply and the high cost of other sources of energy in the nation. The goal of this project is to meet the urgent need for more portable, environmentally friendly, affordable and dependable energy sources in a variety of settings. This project utilized solar energy, the most abundant

energy source known to man. The setup consists of a solar panel component for energy collection and conversion, a battery component for storage, and an inverter component for converting solar energy into a form that can be used by electrical devices and home appliances. A portable solar power supply system was assembled and constructed to harvest solar energy from the sun and convert it into electrical energy that can be stored in batteries. The portable solar power system was able to power a 300 Watts electric kettle and electric blender in experimentation.

**Keywords:** Portable, solar-powered, home appliances, environmentally friendly, electrical energy

11

20248046S

## **Background Gamma Radiation in Grazing Patch Lands and Earthen Fish Ponds in Iju-Gas-Pipeline, Ota, Nigeria**

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**Abstract.** The pursuit of Sustainable Development Goal 3 (SDG3) concerning sound health and well-being is actively underway in many countries. This study investigates the safety of inhabited environments in relation to background gamma radiation levels linked to naturally occurring radionuclides (NORs). The research focuses on the Iju-Gas-Pipeline area, a significant settlement within the Ado Odo Ota Local Government Area, comprising both residential and commercial zones. Radioactivity levels were measured in situ around a grazing land and an earthen fishpond located in the Iju-Gas-Pipeline grassland and valley, respectively. The impact of natural radionuclides on the area was assessed by measuring ambient gamma dose rates and specific activities of NORs using a mobile RS-125 gamma spectrometer from Radio Solution Inc. Radiological health risk indices were calculated based on the activity concentrations of the NORs per unit mass. For the grazing land, background gamma dose rates ranged from 13.94 to 17.92 nGyh<sup>-1</sup>, with a mean of 15.40 nGyh<sup>-1</sup>. The specific activities of the NORs 40K, 238U, and 232Th varied from 0.0 to 63.20, 22.14 to 34.44, and 1.23 to 6.81 Bqkg<sup>-1</sup>, respectively, yielding average values of 47.40, 27.95, and 4.62 Bqkg<sup>-1</sup>. In contrast, the earthen fishpond exhibited ambient gamma dose rates from 2.54 to 10.80 nGyh<sup>-1</sup>, averaging 7.54 nGyh<sup>-1</sup>, with activity concentrations of 40K, 238U, and 232Th averaging 0.0, 15.17, and 2.34 Bqkg<sup>-1</sup>, respectively. All measured background gamma dose rates, average activity concentrations of NORs, and estimated mean radiological hazard indices were significantly below threshold limits. Therefore, this study concludes that the Iju-GasPipeline area is radiologically safe.

**Keywords:** SDG3, Background radiation, grazing land, earthen pond, risk parameters, Iju-Gas-Pipeline



12

20248047S

**In-vitro Antifungal Activity of Leaf Extracts Of *Chrysophyllum albidum*,  
*Celosia argentea* and *Bauhinia monandra* Against Phytopathogenic Fungi  
Isolated from *Carica papaya***

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**Abstract.** *Carica papaya* proffers both health and economic benefits to man but is affected by fungal diseases which cause economic losses and limited outputs. The utilization of synthetic fungicides has presented toxicological effects on man and his environment, while medicinal plants have reportedly served as bio-friendly substitutes due to the presence of phytochemicals. In this study, the in-vitro antifungal activity of *Chrysophyllum albidum*, *Celosia argentea*, and *Bauhinia monandra* leaf extracts (n-hexane, ethyl acetate, ethanol, methanol, and aqueous solution) on fungal pathogens was investigated against *Aspergillus*, *Penicillium*, *Rhizopus*, and *Trichoderma* fungal isolates from *Carica papaya*. The agar well diffusion method was applied for in-vitro screening, minimum inhibitory concentration (MIC), and minimum fungicidal concentration (MFC). *C. albidum* methanolic extract showed the highest inhibition zone (32 mm) against *Aspergillus fumigatus*. The ethanolic extract of *C. argentea* had the highest inhibition zone against *Penicillium* spp (39 mm) while the aqueous extract of *B. monandra* had its highest antifungal activity against *A. niger* (37.33 mm). The MIC and MFC of all the extracts ranged between 15.625 to 31.25 mg/mL and 31.25 to 125 mg/mL, respectively. The plant extracts exhibited equal/higher antifungal activity compared to ketoconazole (control). This research has shown the potential use of *C. albidum*, *C. argentea*, and *B. monandra* leaf extracts as organic fungicides for plant preservation against fungal infections

**Keywords:** Antifungal, *Chrysophyllum albidum*, *Celosia argentea*, *Bauhinia monandra* *Carica papaya*, Fungi, Phytochemicals

13

20248049S

## A Fine-Tuned GPT2 For Intelligent Auto Response System Using Contrived Email Transfer Learnin

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**Abstract.** In this paper, we present a novel approach to enhancing intelligent auto-response systems by fine-tuning GPT-2 using a contrived email dataset through transfer learning. Traditional natural language models often lack the specificity and contextual understanding necessary for generating relevant and coherent email responses. To address this, we developed a specialized dataset mimicking diverse email interactions and fine-tuned GPT-2 to adapt its generative capabilities for various email contexts, such as customer service, professional inquiries, and informal communication. Our experimental results demonstrate significant improvements in response quality, with an increase in BLEU score from 0.53 to 0.66 compared to the baseline model. Qualitative analysis and human evaluations corroborate these findings, highlighting the model's ability to generate fluent and contextually relevant replies that closely align with expected human behavior. This study illustrates the potential of transfer learning in fine-tuning large language models for domain-specific applications and provides a robust framework for deploying intelligent auto-response systems in real-world scenarios. Future work will explore reinforcement learning techniques to mitigate current limitations, such as handling ambiguous prompts and improving response diversity.

**Keywords:** Transfer Learning, Domain-Specific Language Models, Fine Tuning, Natural Language Processing (NLP), Email, BLEU Score, Generative Pre-trained Transformer (GPT), Automated Response.

14

20248050S

## Modelling and Prediction of Path Loss using the ARIMA models at Ku-band in Lagos State, South Western Nigeria

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**Abstract.** Path loss prediction using four different ARIMA models at Ku-band in Lagos using eight years of datasets has been carried out. The method consists of some steps in the run time analysis: the first stage involved identifying the ARIMA model by creating an Autocorrelation

Function (ACF) and Partial Autocorrelation Function (PACF) plots and checking if the data are stationary. The second stage involved estimating the ARIMA model, which consists in testing the parameters' significance after obtaining the model's parameters. The ARIMA model is adopted if the parameters are significant. The third stage involved diagnostic checking, in which a test was carried out to see if the adopted model was statistically significant. The fourth stage involves predicting the path loss after the diagnostic process using the adopted or selected ARIMA model. From the analysis, it can be concluded that the best ARIMA model for path loss prediction in Lagos at Ku-band is ARIMA (1,0,0). The ARIMA (1,0,0) model is a better path loss prediction model than the other ARIMA models, indicating that the model parameters are significant at 0.05 with the slightest MSE error, thereby meeting the test of independence. Therefore, engineers and policymakers in the Nigerian telecommunication industry should assess the impacts of path loss within the study location towards sustainable telecommunications and infrastructure (SDG goal 9) for planning and setting radiowave propagation technologies in the study location and Nigeria at large

**Keywords:** ARIMA, Ku-band, Modelling, Nigeria, Path loss

15

20240851S

### **Qualitative Analysis of Background Radiation from $^{238}\text{U}$ , $^{232}\text{Th}$ and $^{40}\text{K}$ in Selected Location in Ekiti State using Aeroradiometry Data**

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**Abstract:** Airborne radiometric data collected from Nigeria Geological Survey Agency (NGSA) for selected locations of Ekiti State were analyzed using Oasis Montaj to determine the radionuclides content of the air at 500 m above the ground. The absorbed dose was consequently estimated from the radionuclides content measured. The estimated activity concentration of  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  ranges from 0.77-9.50 ppm, 3.49-52.84 ppm and 0.21-4.40% respectively. The radionuclides content were re-constructed in Bq/kg using the relevant conversion factors and the values range from 9.49-117.36 Bq/kg, 14.17-214.51 and 65.33-1377.32 for  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  accordingly. The qualitative analysis gave the value of the absorbed dose of 31.92-214.04 nGy/h. The ternary map indicates the relative abundance of  $^{40}\text{K}$  in the study area.

**Keyword:** Airborne radiometric data, Absorbed dose, Radioelements, Mapping, Oasis Montaj

16

20248057S

## Synthesis of High Purity Mesoporous Silica Derived from Rice Husk for Solar Cell Applications

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### Abstract

Engineering materials synthesis has been tailored towards the green synthesis approach as it reduces the emission of harmful substances into the atmosphere. Recently, mesoporous silica has attracted widespread investigation due to its potential as a solar cell semiconductor material. The abundance of silica in rice husk made it a cost-effective and environmentally friendly material. Despite, the abundance of silica in rice husks, obtaining high-purity silica is still challenging. Silica was extracted from rice husk using the sol-gel method without the use of harmful chemicals. As-synthesized silica from rice husk was examined with Fourier transform infrared Spectroscopy. The FTIR result revealed an absorbance peak at  $797.7\text{ cm}^{-1}$  corresponding to the Si-O-Si functional silica group. The XRF result showed that 94 wt%  $\text{SiO}_2$  was present in the sample. The SEM/EDX result revealed that nanoparticles silica with high purity was produced. The BET surface area of as-synthesized mesoporous silica was found to be  $222.83\text{ m}^2/\text{g}$ . The large surface area obtained suggests that the silica produced has the potential to be used as a solar cell electrode when incorporated with the  $\text{TiO}_2$ . The results obtained in this research suggested that high purity silica could be produced from rice husk without a high heat treatment process.

**Keywords:** Solar Cell; Silica; Rice Husk; Characterization, BET surface area

17

20248058S

**Trichoderma: A Review of its Mechanisms of Action in Plant Disease Control****Olusola Luke Oyesola<sup>1,2</sup>, Rosemary Tonjock Kinge<sup>4</sup>, Olawole Odun Obembe<sup>1,2,3\*</sup>**Department of Biological Sciences, Covenant University, Ota, Nigeria<sup>1</sup>Plant Science Research Cluster, Covenant University, Ota, Nigeria<sup>2</sup>UNESCO-Chair on Plant Biotechnology, Covenant University, Nigeria<sup>3</sup>

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**Abstract.** Trichoderma has been widely studied for its potential as a bioagent for managing plant pathogens. Trichoderma's biological control mechanisms include competition, modification of environmental conditions, antibiosis, induction of plant defensive mechanisms, mycoparasitism, and plant growth promotion. Trichoderma produces diverse metabolites that have antifungal activity. These metabolites include peptaibols, gliotoxin, and trichokonins. Trichoderma also produces  $\beta$ -1,3-glucanases and chitinases that can break down fungal pathogens' cell walls. In addition to direct antagonism against fungal pathogens, Trichoderma can also trigger localised or systemic resistance in plants, which is achieved through the production of elicitors such as chitin oligosaccharides and  $\beta$ -glucans that activate plant defence responses. Trichoderma can also form mutualistic associations with plants. Trichoderma colonises plant roots in these partnerships, enhancing growth by boosting nutrient uptake and triggering systemic resistance. As a biomanagement agent, Trichoderma offers numerous benefits compared to traditional crop protection methods, like synthetic pesticides.

**Keywords:** Trichoderma, fungi, pathogen, mode of action, plant diseases, biocontrol, microbe associated molecular pattern (MAMPs)

18

20248061S

## Computational Analysis on Novel Niobium-Based Half-Heusler Alloy (NbIrSb) for Waste Heat Recycling Process

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**Abstract.** Using thermoelectric materials to convert waste heat into electricity presents a viable way to drastically lower world energy consumption. Half-Heusler compounds are one class of materials that have shown great promise for high-temperature thermoelectric applications, offering a workable way to alleviate the current energy problem. This paper investigates the structural, electronic, phonon, and thermoelectric properties of the HalfHeusler combination NbIrSi with an 18-valence-electron. To explore the properties and potential of novel NbIrSi alloy for energy conversion applications, computational methods like density functional theory (DFT), the finite displacement method, and semi-classical Boltzmann transport theory (BTE) are utilized. The figure of merit of the n-type and p-type of the NbIrSi compound is about unity at room and elevated temperature, indicating its potential as a good thermoelectric material.

**Keywords:** Half-Heusler, DFT, Transport, Figure of Merit.

19

20248063S

## Mental Health Awareness Community Center For Generation Z in Bandung City Based on Recreational Therapy

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**Abstract.** Mental health is an essential component for ensuring a healthy quality of human life. Mental health can be done with mental health efforts that have been regulated in the Law RI Number 18 Year 2014 on mental health. Given the approach set out in the Act, the Ministry of Health has held an agenda for the transformation of primary services from curative and

rehabilitative to preventive promotive. Preventive promotive efforts for mental health need to be undertaken and started to be promoted especially with adolescents. But in 2022, the Indonesia Adolescent National Mental Health Survey (I-NAMHS) stated that one in three adolescents in Indonesia has mental health problems, and one in twenty adolescents has a mental health disorder. This is due to a lack of adolescent understanding of the importance of mental health and the lack of understanding of managing mental health problems. (healing). The establishment of a community center for mental health awareness is an effective solution to provide education to the Z-generation related to mental health. This can be supported by recreational therapy techniques that can be used as a basis for planning activities. The study aims to measure the openness of the interior design concept of the Community Center for Mental Health Awareness for Generation Z in Bandung City based on recreational therapy. It is hoped that the presence of this community center will make a positive contribution to the knowledge of the Z generation of the importance of mental health through space for education and recreation.

20

20248067S

### **First-Principles investigation of the Structural, Electronic and Lattice Dynamics of Cs(X = O, S, Se, Te) Perovskites**

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**Abstract.** Perovskite materials exhibit diverse electronic and structural properties, making them intriguing candidates for several material science applications. For this study, the ground state properties of the CsCrX<sub>3</sub> (X = O, S, Se, Te) perovskites were studied with CASTEP, the lattice dynamics of the perovskites was investigated using the density functional perturbation theory implemented in the quantum ESPRESSO code. The optimized lattice constants for each unit cell were observed as thus:  $a = b = c = 5.983 \text{ \AA}$ ,  $4.991 \text{ \AA}$ ,  $5.794 \text{ \AA}$ , and  $5.233 \text{ \AA}$  for CsCrO<sub>3</sub>, CsCrS<sub>3</sub>, CsCrSe<sub>3</sub> and CsCrTe<sub>3</sub>, respectively, indicating a cubic perovskite compound structure with cell angles  $\alpha = \beta = \gamma = 90^\circ$ . The phonon dispersion curve of the studied perovskite shows dynamical instability at zero GPa pressure.

**Keywords:** Electronic, Perovskite, Phonon, CASTEP, QE

## Construction of an Arduino Based Smart Energy Meter

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**Abstract.** The design of a smart energy meter with an arduino that measures the current, voltage, energy and power by an individual or small organization is very important. Electricity is among the basic requirements for the maintenance of life contents. But in our country, we have many localities where they have constant electricity and others with little or no access to electricity. Consumers are dissatisfied with the services been provided by the electricity company, and the absurdity in monthly bills are the most common source of displeasure. The issue of having outrageous bills despite the lack of electricity, the ignorance of how much voltage and current is being used in homes led to this creation of this project. This focuses on the system's problem which entails workforce, time consumption and manipulations of readings by an official authority while producing the bill to the consumer. This project consists of the following components Energy Meter, Arduino DANO Board, Global System for Mobile Communications (GSM) Module, Capacitor, Mobile Phone, Load, Current sensor acs712, Voltage sensor, Transformer, Vero Board, and liquid crystal display (LCD). The energy meter continually monitors the readings and the Arduino processes this data and the readings are uploaded on the liquid crystal display (LCD) of the device and when the readings are taken the Global System for Mobile Communications (GSM) module posts the readings to the thingspeak on the mobile phone. The constructed device displayed the energy, power, current and voltage been consumed with varying loads used and the readings were uploaded on the platform used (thingspeak). From the results, it shows that the device is working perfectly. There was fluctuation in the power, voltage and currents but constant increase in the energy. Asides from the saving of cost in relation to remote reading of meters, it is hoped that implementation will encourage energy efficiency and raise awareness of energy consumption and demand side participation in the national energy market. This project is recommended for the electricity power company (PHCN) and it is also recommended for individuals that reside in some localities because it would help save cost and it is convenient.

**Keywords:** Energy Meter; Arduino, liquid crystal display (LCD), Global System for Mobile Communications (GSM) module.



22

20248071S

## Cross-Species Transferability of Cowpea SSR Markers to *Vigna Radiata* (L.) (Mung Bean) And *Phaseolus Lunatus* (L.) (Lima Bean)

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**Abstract.** The transferability of simple sequence repeat (SSR) markers across closely related species can significantly enhance our ability to uncover genetic variations in underutilised legumes, addressing the limitations posed by the scarcity of crop-specific molecular markers. Given the close evolutionary relationships within the legume family, we explored the transferability of 10 cowpea (*Vigna unguiculata*) SSR markers to 10 accessions each of mung bean (*Vigna radiata*) and lima bean (*Phaseolus lunatus*). The results indicated that 90% of the markers were successfully amplified in lima bean and 70% in mung bean, while one specific marker (SSR 7061) failed to amplify in any of the accessions. Markers SSR 7079, VM 40, VM 54, and VM 74 had an amplification success rate ranging from 70% to 100% across the accessions. On the other hand, SSR 7000 and SSR 7053-2 had 55% and 50% amplification rates, respectively, while SSR 6313, SSR 37, and VM 71 exhibited less than 50% amplification across the accessions. The study generated 21 alleles from these markers, with allele counts per marker ranging from 1 to 3 and an average of 2.10 alleles per locus. The polymorphic information content values varied between 0.00 to 0.57 with an average value of 0.32, indicating moderate variability, while gene diversity measurements ranged from 0.16 to 0.64 with an average diversity value of 0.39. Regarding genetic relationships among the accessions, cluster analysis using the unweighted pair group method (UPGMA) revealed two main groups. Factorial analysis divided the accessions into four groups, with TPI-2428, TPI-2432, TVr-46 and TVr-6 forming distinct outliers. This cross-species applicability not only reinforces the conservation of genetic markers among legumes but also underscores the potential for these markers to assist in the breeding and genetic improvement of mung bean and lima bean.

**Keywords:** Transferability, SSR Markers, Underutilised Legumes, Genetic diversity, Breeding

23

20248073S

## **Development and Performance Evaluation of Portable water-cooling system using thermoelectric peltier modules**

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**Abstract.** High global temperatures have increased the occurrence of heat waves in most parts of the world, and this has increased the utility cost as more cooling devices are being produced for adaptation. This study deals with the performance evaluation of a portable water-cooling system using thermoelectric peltier modules. The experimental setup involved measuring the temperature reduction of water samples for different volumes (500 ml, 750 ml, and 1000 ml) over 60 minutes at equal interval. The heat sink was used to enhance the absorbed heat transfer in the system while Arduino Uno serves as the central control unit. Results showed that effective temperature reductions were achieved with cooling capacities ( $Q_c$ ) for different volumes of water. The system coefficient of performance (COP) ranges from 0.0639 to 0.0958 which indicate lower energy consumption.

**Keywords:** Water cooling system; Peltier module; Arduino Uno, Heat sink

## ENVIRONMENTAL/BUILT AND SUSTAINABLE DEVELOPMENT

24

20248002S

**Bottom-Up Strategies for Creating Sustainable Urban Settlements through Sustainable Real Estate Development Practices****A. Jogunola<sup>1</sup>, K.B. Akinbola<sup>2</sup> and N. Ajienkwo<sup>1</sup>**<sup>1</sup>Department of Estate Management, University of Ibadan, Ibadan, Nigeria<sup>2</sup>Department of Estate Management, Olabisi Onabanjo University, Ago Iwoye, NigeriaCorresponding email: [a.jogunola@ui.edu.ng](mailto:a.jogunola@ui.edu.ng)

**Abstract** This study explores the concept of sustainable urban design and its significance in achieving SDG-11 through sustainable real estate developments, focusing on Lagos, Nigeria. It investigates effective strategies for creating urban settlements by integrating sustainable real estate (buildings) and developing Eco-cities such as Alaro City in Epe, Lagos. Exploratory research method was employed, and key findings highlight the importance of integrating sustainable building design, green spaces, efficient public transportation, renewable energy, efficient water management systems etc. into real estate development at the planning stage. The study identifies government, architects, quantity surveyors, builders as well as individual real estate developers as crucial stakeholders in promoting sustainable real estate developments through the bottom-up approach that will eventually result into sustainable urban settlements. Recommendations emphasize the need for government prioritization of public awareness campaigns, and strategic planning such as giving necessary encouragement and support to local building materials industries. It was equally recommended that certain built environment professionals such as the architects, and quantity surveyors that are the first contact to real estate developers should endeavour to always advice and convince their clients to embrace sustainable real estate design and construction.

**Keywords:** Bottom-Up, Lagos, Sustainable City, Sustainable Real Estate.

25

20248009S

## **Impact of Industrialization on the Environment: Water Quality Index of Pharmaceutical Effluent Discharged in Ota, Ogun State, Nigeria**

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**Abstract.** There has been an upsurge in the recalcitrance and bioaccumulation of some detrimental pharmaceutical by-products and heavy metals in the aquatic ecosystem. This study determined the water quality index (WQI) of a pharmaceutical effluent discharged in Ota. The physicochemical parameters of the effluent were carried out using turbidimetric (NTU), nephelometric (mg/L), titrimetric (mg/L), conductivity (uS/cm) and spectrophotometric (nm) methods. The parameters assayed include pH, turbidity, conductivity, and temperature. Others include the biochemical oxygen demand (BOD), chemical oxygen demand (COD), biogenic/organic constituents and heavy metals. The physicochemical results obtained were compared with the World Health Organization and United States Environmental Protection Agency standards. These include 4.76±0.07 pH; 1.9±1.00 DO (mg/L) 12.0±1.10 chloride; 3.0±0.03 sulphates; 8.96±0.90 nitrates; 3.21±0.06 phosphates; 29 ±1.12 BOD and 339±2.10 COD. The distribution of heavy metals is in the following order: Zn > Cu > As > Ni > Pb > Cd > Hg. All the results obtained were within acceptable limits of the USEPA and WHO standards. The estimation of the overall quality of the wastewater gave a WQI of 32.54 which suggests a good water quality that is re-usable for irrigation and other purposes.

**Keywords:** Water Quality Index, Physicochemical properties, Biochemical Oxygen Demand, Heavy Metals, Pharmaceutical Effluent.

26

20248011S

## **Assessment of Strategies and Elements of Natural Ventilation Used in Selected Universities in South Western Nigeria**

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**Abstract.** The global demand for energy has been steadily increasing, raising concerns about the environmental impact of energy production and consumption. Natural ventilation systems offer an attractive solution for energy-efficient buildings. By harnessing the natural forces of wind and buoyancy, natural ventilation effectively introduces and distributes fresh air within buildings to

benefit occupants. A strong synergy between architecture and the air circulation system is crucial to ensure the effectiveness of natural ventilation. This study employed qualitative methods and focused on two university buildings in Nigeria to evaluate the presence of characteristic ventilation elements, as well as the ventilation principles and strategies employed in these buildings. The study's findings illustrate how buildings can integrate various strategies to promote natural ventilation and develop energy-efficient structures.

**Keywords:** Natural Ventilation, Ventilation Principles, Ventilation Elements, Energy Consumption, South West, University.

27

20248012S

## **SELF-HEALING CONCRETE (BIO-CONCRETE) CONTAINING LIMESTONE POWDER: STRENGTH AND DURABILITY PROPERTIES**

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**Abstract.** Numerous advantages over conventional concrete have been demonstrated by the use of bio-concrete, which is created by adding microorganisms to conventional concrete. Numerous researchers have become interested in this approach. Research on the durability and strength of bio-concrete that uses limestone powder as a filler instead of regular Portland cement is lacking, though. In order to compare and contrast the results with regular concrete, which does not contain either limestone or bacteria, the aim of this study is to examine the strength and durability properties of bio-concrete made with bacillus subtilis as the healing agent and limestone powder as a supplementary cementitious material (SCM) at percentage replacement levels of 0%, 5%, 10%, and 15%. The study investigated the strength and durability properties of the bio-concrete mix using a combination of materials and tests, including bacillus subtilis as the bacteria, regular Portland cement, limestone powder as the SCM, fine and coarse aggregates, and tests for sulphate attack, alkaline attack, splitting tensile, compressive strength, and flexural strength. The samples were subjected to water ponding for three days to induce an initial crack width of no more than 0.3 mm. To ascertain the strength properties, the samples were then further cured by water ponding for seven, fourteen, twenty-one, and twenty-eight days. To ascertain their durability qualities, they were also submerged in sulphate and alkaline solutions for 28 and 56 days. The samples' microstructure was evaluated using XRF, SEM-EDS, and XRD as well. Based on the data collected, the weight loss, strength, and crack closure indices for each sample were calculated and compared to the control sample. In comparison to the control, it was found that the bacteria's presence decreased the samples' crack width as the curing age rose. Additionally, the strength,

durability, and microstructure of the self-healing concrete were enhanced by the bacteria and limestone powder, particularly when the concrete contained 10% limestone powder. Based on this study, it can be said that bacillus subtilis can cause concrete to self-heal by forming spores that reduce or completely seal cracks in the concrete. Additionally, adding limestone powder can result in concrete that heals more effectively.

**Keywords:** Bio-concrete, Limestone Powder, Supplementary Cementitious Material, Bacillus Subtilis, Ordinary Portland Cement.

28

20248013S

**Spatial and Sustainability Requirement in Shopping Mall Design: A Case Study Of Novare Shopping Mall Abuja**  
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**Abstract** The shopping malls today are iconic commercial buildings that promotes leisure in terms of shopping and recreation as a major destination both in urban and suburban areas. Since shopping malls are now found in a variety of constructed environments, it is important to take sustainability principles and spatial constraints into account. The aim of this study is to explore the spatial and sustainability requirements in Nigerian shopping mall using Novare gateway mall Abuja as a case study. The research method that was adopted was case study approach and data was collected through visual survey and review of existing literature. The spatial and sustainability requirements for a shopping mall design were evaluated using a 5-point grading system in conjunction with descriptive and visual data analysis. Seven variables were analysed for spatial requirements while five variables were analysed for sustainability requirement for shopping mall design. The study revealed that Novare Gateway mall does not place enough emphasis on sustainable design requirements. Majority of the sustainability standards were either very inadequate or not considered. While the shopping mall meets the spatial requirements. The study hereby recommends that shopping malls in Nigeria should improve its sustainability by utilizing cutting-edge technology and industry best practices for managing water, renewable energy sources, and green building materials. It is important to include design principles including sun shading, natural ventilation, appropriate building orientation, and natural lighting and ventilation.

**Keywords:** Shopping mall, Spatial requirement, Sustainability

29

20248014S

## A Comparative Analysis of the Occupancy Rate of the Various Classes of Hotels in Ikeja, Lagos for Sustainable Returns

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**Abstract.** The essence of hotels, no matter the class, is to have lodgers occupying them for various reasons amongst others. However, it has turned out that cutting across the various classes of hotels they have not been maximally occupied. Previous researches have studied various classes of hotels with respect to various issues while some others have focused on the occupancy rate of hotels notwithstanding the class. This present study assesses the occupancy rates of all the classes of hotels in the study area in a bid to determining any significant difference to enable investors to be well guided for sustainable returns. The study being a survey sampled the entire registered twenty-nine hotels in the study area cutting across the various classes as provided by the Nigerian Tourism Development Corporation (NTDC). Data collected was analysed using descriptive statistics such as percentage and harmonic mean where it was discovered that a minimum of 70% occupancy rates was evident for all classes of hotels. The use of the Chi-Square Test at 5% level of significance revealed that with a minimum p value of 0.583 the occupancy rates of the various classes of hotel have no significant difference and as such hotels regardless of their classes are faced with the same saturated market situation or standardized service delivery depending on the choice of lodgers. This in essence has consequences for strategic decision making in the hotel industry enabling stakeholders to improve their operational plans amongst others for sustainable hotel establishment.

**Keywords:** Occupancy, Occupancy Rate, Hotel, Hotel Classes; Ikeja, Sustainability

30

20248015S

## Assessing Rental Loss in Vacancy of High-Rise Commercial Buildings in Marina, Lagos, Nigeria

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**Abstract.** The vacant high-rise buildings in Marina, Lagos, Nigeria, triggered this research. This study therefore aims at comprehensively assessing rental loss due to vacancies in high-rise commercial properties in the study area. Twelve high-rise buildings which are buildings of at least thirteen floors were identified in the study area but the focus was on six (6) of such buildings as the other six (6) were singly tenanted and not prone to vacancy as it were. Primary data was collected through the administration of well-structured questionnaires distributed to the six (6) concerned property managers of the high-rise commercial properties under consideration, resulting in a response rate of 100%. There was also a conduct of interview with the property managers of the concerned high-rise commercial properties. Descriptive statistical tools were employed to analyse the obtained data. The paper presents significant findings derived from the study, shedding light on the proportion of vacancies experienced in the concerned properties and the perspectives of managing agents on the reduction of market rent in high-rise commercial properties as a means of curbing vacancies in the properties amongst others. Findings indicated that property owners typically do not reduce rent no matter the vacancy experienced, reasons attributed to market perception, operational costs, current lease agreement and economic strategy. The use of harmonic mean revealed a 24% loss in the rent accruable to high-rise commercial buildings in the study area as a result of the vacancy experienced. Based on the research outcomes, recommendations were made to improve marketing and promotional efforts in order to increase occupancy rates while also investing in effective marketing strategies to showcase the value of their properties. Implementing these recommendations is expected to reduce vacancy rates in high-rise commercial properties by enabling these properties to operate at maximum capacity thereby improving rental income. This comprehensive approach will help property owners and managers optimize their rental strategies and achieve better financial outcomes.

**Keywords:** Rent, Rental Loss, Vacancy, High-Rise Commercial Properties, Marina



31

20248019S

## A Review of Challenges Influencing Stakeholders Engagement in Construction Project Delivery

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**Abstract.** Stakeholder engagement is an important factor that contributes to optimal construction project performance. Challenges of projects cost overruns, non-delivery of projects on schedule and not meeting specifications are partially linked to poor stakeholder engagement. Despite the benefits in engaging stakeholders' there are challenges hindering effective engagement of stakeholders' in construction project performance. This study aimed at examining the challenges influencing stakeholders' engagement in construction projects. Desk methodology was adopted for the study. Data was collected from existing resources by comprehensively reviewing literature from published articles relating to stakeholders' engagement in construction industry from 2014 - 2024. Twenty-three challenges hindering effective stakeholders' engagement in construction were identified. Result revealed that conflicting interest/ clash of personalities, ineffective communication, inactive stakeholder engagement and inclusivity, lack of transparency in decision-making processes, lack of consultation and information disclosure and distrust, limited or resource deficiency and lack of actionable knowledge about best practices of stakeholder engagement were the most cited challenges influencing stakeholders' engagement. It was concluded that the major factors identified must be given adequate consideration for an operational and efficient stakeholder's engagement. An effective communication channel for managing stakeholders' interests and priorities through consultation and inclusivity in decision-making processes is recommended. Reviewing the challenges encountered in engaging stakeholders in construction projects has enlighten the understanding of stakeholder in managing construction projects.

**Keyword:** Construction, Engagement, Project success, Stakeholder, Stakeholder Interest

32

20248023S

## Bibliometric Analysis of Literature on Smart Technology Integration in the Construction Industry

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**Abstract.** Globally, the construction industry is experiencing a surge in new technologies due to the transitions from conventional methods to digital tools. The construction industry is utilizing advanced digital technologies to reduce operational inefficiencies. Soaring demand for homes is exposing the limitations of traditional construction methods. The study aims to analyze research trends in smart technology integration in the construction industry through bibliometric analysis. The search results from the Scopus database were extracted using the VOS viewer software. After filtering, the study analyzed 19,225 papers related to “Smart Construction” based on the subject area, document type, source title, publication stage, source type, language, and keywords; 588 papers were found suitable for the analysis. The United Kingdom, the United States, and Hong Kong conducted the most impactful research on smart construction. The Russian Federation, China, the United Kingdom, and the United States are the countries with the highest number of publications on smart construction. The most cited publications were reviewbased and focused on blockchain, sustainable infrastructure, digital construction, etc. The work explicitly highlights the overview of the technologies being used in smart construction practices. This study aids researchers and built environment professionals in comprehending the integration of smart technology in the construction sector by offering baseline data for future research. The study suggests the need for case study-based research to comprehend better the practical application of smart technology in the construction sectors, thereby enabling further trend analysis. The findings of this study can guide future research and development in the construction industry, helping to improve efficiency and sustainability.

**Keywords:** Smart City, Building Information Modelling, Internet of Things, Intelligent Building, Industry

33

20248028S

## Critical Success Factors towards the Adoption of Lean Practices (LPs) in the Nigerian Building Industry

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**Abstract.** Lean construction practices have been adopted in the building industry to address issues of cost and time overruns and material waste, which are crippling the growth and development of the industry. However, the implementation of Lean Practices (LPs) have been identified to be low due to some factors that limiting its adoption. Therefore, there is a need to identify factors that could encourage LPs adoption in the Nigerian building industry towards acquiring its numerous benefits. Thus, this study examined such factors that's can encourage the successful implementation of LPs in Nigeria. The study was carried out using questionnaire survey for data collection. Data was sampled from building industry professionals who represented selected firms from five geopolitical zones of Nigeria. A descriptive analysis was conducted on the data collected and the results were presented using tables. Results from the investigation revealed training and education of employees, motivation of personnel towards new methods and change, and improvement of projects and parties' coordination as the important factors that could encourage the adoption of LPs in the Nigerian building industry. Therefore, stakeholders should pay attention to these three critical success factors among others towards increasing the adoption of LPs in the Nigerian building industry.

**Keywords:** Nigerian building industry, Lean Practices (LPs), Critical success factor, Lean Construction.

34

20248031S

## **Review of Petroleum Sludge Treatment methods and Utilization of Ash as an alternative Green Construction Material**

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**Abstract.** The enormous amount of petroleum sludge (PS) produced by oil companies is one of the primary causes of environmental damage. It is created when oil is extracted, processed, cleaned, and transported. Because petroleum sludge includes spent chemicals, wastewater, waste oil, contaminated sand, and mineral materials, it is categorized as hazardous waste under the Hazardous Wastes Handling Rules and the Environment Protection Act. This PS cannot be disposed of in a landfill until it has been thoroughly deoiled. PS treatment and disposal present serious dangers to most refineries. That's why the treatment became essential. This report provides a detailed evaluation of PS sources, characteristics, and environmental effects in addition to a comparative study of the different thermal and disposal techniques of PS treatment. This review study has the potential to advance our understanding of PS thermal and disposal techniques and future guidelines.

**Keywords:** Petroleum sludge (PS), Petroleum sludge ash (PSA), Treatment methods, Concrete, Waste management.

35

20248032S

## **Effect of Lean Construction Practices on the Performance of TETFund Sponsored Construction Projects in Nigeria**

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**Abstract.** The persistent issues in the Tertiary Education Trust Fund (TETFund) sponsored projects highlight a critical need for innovative approaches to improve project management and execution. This research aims to evaluate the effect of lean construction on the performance of tetfund sponsored construction projects in Nigeria. This study employed survey research design

approach to evaluate the effect of lean construction on TETFund sponsored construction projects in public tertiary institutions. The research population and sample frame consisted of construction professionals such as Architects, Civil Engineers, Builders and Quantity Surveyors) in the department of works who serves as consultants on these TETFund projects in the institutions selected, and administrative personnel in the TETFund Unit at the various institutions). The sample size was 116, obtained using census sampling technique. Primary data was collected using questionnaires, and secondary data from previous literature was used to determine variables for the impact of Lean construction on Tetfund sponsored projects. The data analytical tools include Regression analysis and Analysis of Variance (ANOVA). The study found that Lean Construction (LC) practices did not significantly impact TETFund project performance, likely due to institutional barriers such as bureaucratic delays and rigid structures. However, some positive indicators like Process Optimization and Cost Savings suggest potential benefits. Recommendations include addressing these institutional challenges to enhance Lean practices' effectiveness and conducting further research through pilot studies to assess the impact of refined Lean practices on project outcomes, particularly in the context of government-funded projects.

**Keywords:** Lean Construction, Outcomes, Performance, Process Optimization and Tetfund Projects.

36

20248035S

### **Influence of Client Relationship Management (CRM) Process and Employee Support on the Retention of Architectural Clients**

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**Abstract.** The current study aimed to empirically explain how explain how Client Relationship Management (CRM) process and Employees' support contribute to client retention in architectural firms. Retention of high value clients is a crucial antecedent to the financial thriving of firms. The current study examined the impact of CRM process and employee support on client retention in architectural firms in Nigeria. 189 copies of questionnaire (66.78% response rate) were retrieved from randomly selected respondents in Lagos, Abuja, Kaduna and Port Harcourt, Nigeria. The data was analysed with descriptive statistics and multiple regression analyses using SPSS software. The coefficients of regressions of the predictors of the study showed that CRM Initiation Process ( $\beta = 0.56$ ,  $p = 0.01$ ) and Employee Support ( $\beta = 0.17$ ,  $p = 0.03$ ) had statistically significant impact on Client Retention. However, CRM Maintenance Process ( $\beta = -0.05$ ,  $p = 0.84$ ) had no statistically significant impact on Client Retention. Managerial recommendations and areas for further studies were highlighted.

**Keywords:** Architectural firms, Client Retention, CRM Initiation Process, CRM Maintenance Process, CRM Process.

37

20248036S

**Influence of Architectural Education on Sustainable Design Thinking: A Review of Energy-Efficiency Concepts**

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**Abstract.** The integration of sustainable design thinking in architectural practice is crucial for addressing energy efficiency challenges. However, the influence of architectural education on fostering such thinking remains underexplored. In order to solve this problem, this study examined how teaching architecture promotes sustainable design thinking, with a focus on energy-efficiency. It examined existing literature to evaluate teaching techniques in architecture schools and made a case for a curriculum that incorporates energy-efficient design concepts and fosters a sustainable culture within the programme. Through literature review by content analysis and selective approach of study, the results and findings show that there are significant barriers to the effective implementation of sustainable design education, such as: lack of faculty knowledge, lack of funds, and obsolete assessment techniques. The study concludes that greater collaborative efforts across stakeholders are needed to overcome these difficulties and establish a sustainable culture in architectural education. It is envisaged that this study will encourage architects to design environmentally friendly and energyefficient schemes. The study offers helpful information for creating curricula and formulating policies for education in sustainable design.

**Keywords:** Architectural Education, Energy-Efficiency, Sustainability, Design Thinking.

38

20248041S

**A Study of Intellectual Property Valuation among Estate Surveyors and Valuers and Accountants in Southwest, Nigeria**

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**Abstract.** Intellectual Property (IP) has been recognised as assets that can be sold or bought or used for other purposes such as collateral thereby necessitating their valuation. However, not many empirical studies has been conducted in Nigeria to ascertain the various purposes for which

IP can be valued or reported. Therefore, this study examined IP valuation practice with the aim to fashion out various upon which they are Valued or reported in Southwest, Nigeria. Primary data used for the study were collected from 184 and 41 of Estate Surveying and Valuation firms and Accounting firms respectively in the study area. The data collected were analysed using descriptive and inferential statistics with the aid of Statistical Package for Social Sciences (SPSS version 17). Mean and Relative Importance Index (RII). One of the findings was that the IP asset that are commonly valued or reported in the study area are copyrights (RII = 0.573) and trade mark (RII = 0.526) copyrights. Findings also revealed that purposes such as inclusion in the balance sheet (mean = 2.71), adherence to the provision of business and company laws (mean = 2.63) and purpose of accounting and taxation (mean of 2.61) are the major purposes for which IPs are valued in Nigeria. It therefore implies that there is need to increase awareness and promote IP Valuation education among the practicing ESVs and Accountants. Valuation of IP should be included in the curriculum of tertiary institutions offering estate management across the country.

**Keywords:** Intellectual Property, Valuation Purposes, Valuers, Southwest, Nigeria.

39

20248042S

### **Hedonic Pricing Model Analysis of the Effects of the Lapite Dumpsite on Residential Rental Values in Ibadan, Nigeria**

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**Abstract.** This study investigates the impact of the Lapite dumpsite on residential rental values in Ibadan, Nigeria, employing a hedonic pricing model to quantify the effects of environmental disamenities. The research analyzes data from 108 respondents living in close proximity to the dumpsite, highlighting how various factors influence rental values, including property characteristics, environmental quality perceptions, and demographic variables. The findings reveal a significant negative correlation between proximity to the dumpsite and rental values, with distance emerging as the most influential factor. Specifically, for each additional unit of distance from the dumpsite, rental values increase by approximately ₦104. Other factors, such as the presence of a fence, road accessibility, and air quality perception, also significantly impact rental prices. The study contributes to the understanding of how environmental factors, particularly waste management sites, affect property values, offering essential insights for urban planning and policy development in Ibadan and similar contexts.

**Keywords:** Hedonic pricing model, Environmental disamenities, Rental values, Property, Dumpsite

40

20248044S

**An Evaluation of the level of awareness of sustainable design principles  
among architects in Lagos state, Nigeria**

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**Abstract.** This study investigates the awareness of sustainable design strategies among architects in Lagos, Nigeria, addressing the critical need for environmentally conscious urban development in rapidly growing cities. The research aims to assess the level of awareness and implementation of sustainable design strategies, with objectives to identify the most recognized strategies, evaluate their application in current projects, and determine barriers to widespread adoption. Employing a quantitative approach, the study surveyed 296 registered architects in Lagos, selected using the Cochran equation. Data was collected through structured questionnaires and analyzed using descriptive statistics. Findings reveal generally high awareness levels for energy efficiency and natural lighting strategies, but lower awareness for site preservation and water management techniques. The study highlights a potential gap between awareness and implementation, suggesting the need for enhanced professional development, stronger policy frameworks, and industry-academia collaboration. By providing insights into architects' knowledge of sustainable design, this research contributes to the development of targeted interventions for promoting sustainable urban development. The findings have implications for policymakers, educators, and industry professionals, potentially informing strategies to mitigate environmental impacts of rapid urbanization in Lagos and similar developing cities. This study lays the groundwork for future research into barriers to implementing sustainable design strategies in the Nigerian context, ultimately contributing to the creation of more resilient and environmentally sustainable urban environments.

**Keywords:** Sustainable design, Sustainable design strategies, Architects, Level of awareness, Nigeria



41

20248048S

## **Adoption of Passive Cooling strategies in selected Office buildings in Abuja, Nigeria**

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**Abstract.** This study examines the adoption of passive cooling strategies in office buildings within Abuja, Nigeria, aiming to assess the implementation patterns of various cooling techniques and identify factors influencing their adoption. The research objectives include evaluating current passive cooling practices, analyzing implementation patterns, and developing recommendations for improved adoption. Through a quantitative approach, the study surveyed three office buildings selected via convenience sampling from a population of over fifty buildings, achieving a 90% response rate from 73 distributed questionnaires. Factor analysis revealed fifteen distinct dimensions of passive cooling strategies, accounting for 75.836% of total variance, with enhanced ventilation, thermal mass utilization, and space optimization emerging as primary factors. Findings indicate a strong preference for conventional methods, with operable windows (mean=4.6515), traditional building materials (mean=4.6212), and hard landscape features (mean=4.4923) being the most widely adopted strategies, while sophisticated techniques like evaporative cooling showed limited implementation (mean=1.5937). This research contributes to the growing body of knowledge on sustainable building practices, offering practical insights for architects, developers, and facility managers while highlighting the need for enhanced integration of advanced passive cooling solutions in office building design and operation.

**Keywords:** Sustainable design, Energy Efficiency, Office buildings, Passive Cooling, Nigeria

42

20248059S

## **Healing Architecture in Women's Healthcare Facilities in Lagos, Nigeria: A Sustainable Approach for Therapeutic and Environmental Benefits**

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**Abstract.** This paper investigates the implementation of healing architecture in women's hospitals (WHs) in Lagos, Nigeria, emphasizing the dual benefits for patient recovery and environmental sustainability. Through analysis of selected WHs, this study examines how natural lighting, biophilic elements, and ventilation contribute to both ecological resilience and improved patient care. A pragmatic approach, including interviews with patients and healthcare providers and quantitative analysis from structured questionnaires, highlights the positive impact of healing architecture on patient well-being. Findings indicate that healing architectural elements not only enhance recovery rates and overall patient satisfaction but also support sustainable healthcare practices by reducing energy usage and enhancing climate resilience. This study underscores the value of evidence-based architectural solutions that integrate health and environmental goals, situating healing architecture within broader sustainable development objectives. This paper advocates for a patient-centred, ecologically responsible approach to healthcare design in Nigeria's urban centres.

**Keywords:** Healing architecture, Hospital, Patient well-being, Therapeutic environment, Lagos Nigeria.

43

20248075S

### **Exploring the dynamics of financial risk impact on property development in Lagos state, Nigeria**

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**Abstract.** This study explores the dynamics of risks of financing property development projects in the study area taking cognizance of the current wave of economic and financial hardship and uncertainty in the country. Property development firms and real estate surveying and valuation firms that are involved in property development and registered with the Real Estate Developers Association of Nigeria (REDAN) constituted the study focus. Convenience sampling technique to select 100 respondents for the administration of questionnaires physically and electronically. Response rate of 86% was achieved with questionnaire administration. Basic statistical tools of frequency, percentages, charts as well as principal component analysis was engaged for data analysis which was eventually presented in tables, text and charts. Findings revealed amongst others that residential property development constituted the largest of the firms' development projects while regulatory risks, financial risk and market risks constituted the top three challenging risk facing real estate development in recent times. The study suggests off-shore financing and patronage to widen the market subscription and a dedicated team of professionals to oversee and ensure necessary regulatory compliance and communication.

**Keywords:** Property, finance, risk, development, residential, investment

## ENGINEERING/GEOSCIENCES AND SUSTAINABLE DEVELOPMENT

44

20248017S

**CLIMATE CHANGE AND SPACE WEATHER; AN INVESTIGATION OF  
CORONAL MASS EJECTION AND COSMIC RAYS DURING INTENSE  
GEOMAGNETIC STORMS**

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**Abstract** Events related to space weather, especially strong geomagnetic storms, present serious obstacles to our satellite-dependent systems and technology infrastructure. The magnetosphere, one of the most significant layers of Earth's atmosphere, is necessary for absorbing charged particles from the Sun including coronal mass ejections (CMEs) and cosmic rays that could have devastating effects on the Earth. The goal of this study is to investigate further the phenomena of CMEs, with a particular emphasis on their appearance during strong geomagnetic storms. By carefully extracting and analyzing data from the NASA OMNI Web, the study shows how relevant CMEs are by highlighting related patterns and trends. In contrast to the bulk of moderate CMEs over the solar cycle, a noteworthy subset in 2022, 2023, and 2024 had noteworthy repercussions. This subset offers valuable insights into the dynamics of these events within the setting of intense geomagnetic storms.

**Keywords:** Space Weather; Satellite-dependent systems; Coronal Mass Ejections; Geomagnetic Storms

45

20248018S

**ANALYSIS OF COMPLEX RELATIONSHIP BETWEEN EARTH'S  
GEOPHYSICAL REACTIONS AND SPACE WEATHER  
OCCURRENCE (SEISMIC ACTIVITIES) DURING THE SOLAR  
CYCLE 24**

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**Abstract** The study analyze the complex relationship between geomagnetic storms and earthquake data from NASA OmniWeb and ScienceBase U.S. Geological Survey. The results of our analysis show a higher occurrence of geomagnetic storms before earthquakes, with a robust probability. The correlation also varies with earthquake depth, with an increase in geomagnetic storms becoming inconspicuous before deep ones. The findings from the study suggests that geomagnetic storms are more likely to be associated with shallow earthquakes. The study emphasizes the importance of using reliable datasets and identifying potential physical mechanisms to better understand the correlations between geomagnetic storms and earthquakes occurrence.

**Keywords:** Geomagnetic storm, Earthquake Occurrence, Shallow Earthquakes, Earthquake depth

46

20248022S

**Optimal maintenance strategy for power transmission infrastructure**

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**Abstract.** In modern electricity markets, reducing operational costs while improving reliability is a primary concern for power system operators. However, Nigeria's aging power transmission network remains vulnerable, necessitating the implementation of optimal maintenance strategies to enhance system reliability. This study introduces a method for mitigating degradation in transmission components through condition-based maintenance, using a hybrid approach that combines the nonhomogeneous continuous time Markov chain (NHCTMC) for system state detection and the differential evolution (DE) algorithm for optimizing maintenance actions. The method is tested on a substation transmission network under various maintenance scenarios. Results indicate a significant improvement in system reliability (90.3%) and an efficient condition-based maintenance strategy achieving 91.3% power delivery. This approach offers promising potential for enhancing the power delivery capacity of the network.

**Keywords:** Substation, nonhomogeneous, condition-based maintenance, differential evolution algorithm, Markov chain.

47

20248025S

## ASSESSMENT OF ANTHROPOGENIC ACTIVITIES IN OYAN DAM: IMPLICATION FOR IRRIGATION AGRICULTURE

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**Abstract:** The Oyan Dam, located in Southwestern, Nigeria serves as a critical water resource for agricultural and domestic purposes in the Region. However, in recent years, anthropogenic activities have significantly impacted the dam and its surrounding environment. This study employs a field survey to evaluate the extent and nature of anthropogenic activities in the dam. Key factors examined are domestic and agricultural activities. There is sparse data on monitoring the water quality of this dam, hence; data were collected in December 2020 to assess the water quality for irrigation and drinking using these parameters: Na, K, Ca, Mg, electrical conductivity (EC), pH, total hardness (TH), SAR and turbidity. These were compared with the WHO standard

for drinking water and irrigation. The water's pH is slightly acidic, which is against WHO recommendations for a pH range of 6.5 to 8.5. Additionally, the water sample had high levels of BOD and COD, which can negatively affect the health of living things by reducing the amount of oxygen in the water. These findings were obtained from the physio-chemical properties of the water. The investigation also showed that the primary cause of pollution in the dam is wastewater discharge. Efficient techniques for managing water resources, like pollution control, are desperately needed to lessen the negative consequences of these actions and maintain Oyan Dam's viability as a crucial supply of water for drinking and irrigation.

**Keywords:** Water Quality, Effluent, Pollution, Resource Management, Waste.

48

20248027S

## **Stabilization and Environmental Sustainability of Swelling Clays Soils: A Review**

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**Abstract.** Water movement in swelling soils conforms with material continuity. This invariably justifies the differences in the gravitational potential energy during expansion and the anisotropic stresses that press the soil but allow for vertical movement. Under a fluid condition, vane efficiency exhibited by macropores is lowered by swelling of the clay, and a poorly drained soil results in surface saturation. The type of water applied to soil material tends to have an impact on the positioning of cracks in swelling clays, and thus, cracks can remain pathways for preferential flow much after they are covered at the soil surface. Vegetation does cause remarkable movements in swelling soils, which can cause severe damage to engineering structures. However, environmentally friendly biodegradable stabilizers are taking the place of conventional stabilizers, most especially lime and cement. Additionally, biochar amendment, which is ecofriendly, has also been found to reduce the swelling index capability of expansive clay soil. Despite the dangers associated with swelling clay, it has found great use as adsorbents, carriers in drug delivery systems, and the construction of a repository for the disposal of radioactive materials. Hence this paper emphasizes the danger involved in building large structures and road construction on swelling clay soils, highlights recent progress in the inhibition and stabilization of swelling soils to sustain the environment, and enumerates the economic importance associated with swelling clay soils.

**Keywords:** Biodegradable stabilizers, expansive clays, biochar amendments, ecofriendly, drug delivery

49

20248052S

## **Aeromagnetic Exploration for Delineation of Copper-Zinc in Azara, North Central Nigeria**

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**Abstract.** This research focuses on the possibility of Cu-Zn and other deposit in Azara area of Nasarawa State, North Central Nigeria through aeromagnetic geophysical survey. Aeromagnetic data used in this work was obtained from the Nigerian Geological Survey Agency (NGSA) was processed to produce various derivative maps, which include vertical derivatives and the analytical signal map using Oasis Montaj software. Analysis of the magnetic data showed that the magnetic susceptibility ranges from -66.589nT to 129.237nT for negative and positive anomalies respectively. Positive anomalies, ranging from 1 to 129.237 nT, were found to be related to magnetized rock bodies that may indicate Cu-Zn mineralization. Vertical derivatives and the analytical signal maps are maps pointing out areas of magnetism which point to key structures of underground geology. Higher magnetic susceptibility values are interpreted to represent shallow intrusive activity and Cu-Zn prospectivity in the north-western portion of the study area. This is done using the Euler deconvolution attribute with structural indices of 0 and 1 enhancing the definition of lithological contacts and dykes that may host mineralized vein intrusions. It could be observed that the results suggest potential avenues for future research and ground-based studies. The findings of this study add to existing literature on Nigeria's solid mineral deposits and underscore the imperative of optimizing exploration for development of the sector and sustenance of the nation's economy.

**Keywords:** FVD, SVD, CU-ZN, Aeromagnetic, ASM, Geophysics.

50

20248060S

## **Subsurface Characterization and Geo-Environmental Impact assessment of Opolo and Tombia using VES and Seismic Refraction techniques, south-southern Nigeria**

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**Abstract.** This paper examines the subsurface geo-characterization of two towns namely Opolo and Tombia using VES and seismic refraction to investigate the availability of water, ground stability and earthquakes risks. VES data was interpreted from twelve of the stations and six seismic refraction sites to obtain layer resistivities, seismic velocities, and lithological characteristics; these were correlated with the well logs from adjacent wells for ease of interpretation. The outcome reveal that subsurface of Opolo is composed of four fundamental geoelectric layers which includes a deep sandy aquifer and clayey surface layer which might hinder liquefaction but influences the movement of water. However, Tombia has relatively thin sand layers having both sandy and silty sand deposits hence having a high potential of soil liquefaction and erosion during any seismic events. Thus, the study emphasise the necessity of integrating direct VES and seismic refraction data, and lithological information to evaluate the environmental and geotechnical risks. This research meets an important research gap by elucidating complex subsurface facies, providing data to enhance the effective and sustainable management of the groundwater resource and development of infrastructure within similar geological environments, and for hazard mitigation.

**Keywords:** VES, Interpex, Seismic-refraction, Geophysics, Esay-refract.

51

20248068S

## Design Criteria for a Sustainable Power Supply in a Flood-Prone Area

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**Abstract.** Flood-prone locations in Nigeria are faced with challenges caused by natural disasters in terms of flooding due to climate change. The effect of this can be seen in the power outage experienced by residents as a result of the damages incurred on electrical infrastructure from a flooding event. For a sustainable power supply to be put in place to help address this challenge, this study attempts to describe the design criteria required. Ikota Villa Estate in Lekki, Lagos State, Nigeria was chosen as the study location as mentioned in literature as one of the flood-prone location in the country. The result obtained using meteorological data obtained from the National Aeronautic Space Administration (NASA) and HOMER Pro software showed the average solar radiation was at 4.60 kWh/m<sup>2</sup> /day and the average temperature was 26.57oC

**Keywords:** flood-prone areas, flooding, sustainable power supply, design, solar irradiance, temperature, HOMER-Pro software



52

20248072S

## **Application of source parameter imaging technique to the composite aeromagnetic data of Ekiti State for magnetic basement depth determination**

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**Abstract** The source parameter imaging technique was applied to the composite aeromagnetic data of Ekiti State to estimate the depth to the magnetic basement at various points within the study area. Determining basement depth in this type of terrain is essential for groundwater exploration and engineering construction, both of which contribute to the state's development. The aeromagnetic data covering the entire state were processed using the oasis montaj 8.4 software. Firstly, the first order polynomial fitting method was used for the regional - residual separation of the total magnetic field intensity data before the application of the reduction to equator transformation filter on the residual component. The data were further enhanced by using upward continuation smoothing filter to remove the effect of the short-wavelength noise from the data. The depth of the magnetic basement, derived from the source parameter imaging technique, ranges from 116 m to 658 m, which indicate the depths to the top of the magnetic sources within the basement rocks in the study area.

53

20248074S

## **Thickness Estimation of the Dahomey Basin Around Ota and Environs Using Spectral Depth Analysis of Aeromagnetic Data**

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**Abstract.** Sediment thickness analysis can serve as a reconnaissance survey for exploring petroleum and other resources within a sedimentary basin. For this purpose, the Ota area and its adjoining environs in the Eastern Dahomey basin of Western Nigeria were analysed using high-resolution aeromagnetic data (HRAD). The data were acquired from the Nigerian Geological Survey Agency (NGSA) Abuja, which encompasses areas around Ota and the surrounding regions in Ogun and Lagos states, Nigeria. The HRAD was subjected to a 2-D Spectral Depth Analysis (SDA) technique. This spectral analysis method calculates the depth from the Earth's

surface to the top of magnetized rectangular prisms using the slope of the log power spectrum. The total thickness estimation obtained from the analysis indicates a combined sediment thickness ranging from about 0.5 km to 2.8 km. The basin thickness variations were characterized into three zones, namely the Shallow Depth Zone (SDZ), where the sediment depths are below 1 km, likely indicating thinner sedimentary layers. The Medium Depth Zone (MDZ) is characterized by moderate depth values ranging from 1 km to 2 km, suggesting a moderate thickness of sedimentary deposits, and the Deep Depth Zone (DDZ), featuring the greatest depth measurements of above 2 km, suggesting significant sedimentary thickness and regarded as inferred sites for primary petroleum exploration.

**Keywords:** High-Resolution Aeromagnetic Data (HRAD), Spectral Depth Analysis (SDA), Total Magnetic Intensity (TMI), Dahomey Basin, Sediment thickness, Ota

54

20248076S

## Design and Implementation of a Solar-Powered Surveillance Drone

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**Abstract.** Despite advances in drone design and battery capacity, drone flight time limitations have been a problem. Unmanned Aerial Vehicles (UAV) are a technology rapidly deployed for surveillance. Still, it has been seen that the duration of flight time can be challenging due to the discharging rate of the battery used in the drones. The study aims to design and implement a solar-powered surveillance drone that leverages renewable energy to continuously charge drones, ensuring uninterrupted flight without physical connections or human intervention to the drone system. The paper developed a solar-powered charging station that uses solar energy to charge the drone's battery, deploying a Solar Photo voltaic panel, charge controller, and lithium battery. The proposed system is an environmentally friendly and practical charging solution to drone technology. The research provides a revolutionary method that allows missions to continue unhindered and increases the possible uses for drones, thereby solving the persistent problem of drone flight duration limitations. Solar panels with high tracking devices to maximize sun exposure and sophisticated power management strategies reduce energy loss during conversion and storage to increase the efficiency of solar charging stations and wireless chargers, which can be an area for further studies. The system can help farmers solve insecurity issues.

**Keywords:** Unmanned Aerial Vehicles, Solar Photovoltaic, Charge Controller, Battery, Surveillance

**ENERGY AND SUSTAINABLE DEVELOPMENT**

55

20248001S

**Feasibility Analysis of Hybridized Wind/PV Micro-grid for Telecoms Mast Using Energy Estimation Models and Homer**Olayinka Olaogun<sup>1,2</sup>, P.A. Olubambi<sup>1</sup><sup>1</sup> Centre for Nanoengineering and Advanced Materials, University of Johannesburg,

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**Abstract.** There is a remarkable growth and an increasing demand of clean and renewable energy for power generation, especially in remote areas. Its extensive usage lowers carbon footprint. In this paper, effort has been made to analyze a Hybridized Wind/PV Energy System considering both solar and wind power. The focus is to give a cost effective and optimal solution to solve the problem of energy transmission in the telecoms industry, especially in the remote areas of Nigeria. Wind and solar alone can fluctuate, however a practical approach from a hybrid system gives an economical and a reliable energy flow overall system. Containerized diesel generator was utilized as backup when the storage is low, and blackout is experienced. Energy estimation models and HOMER-PRO were used for simulation and optimization. Various system configuration was tried based on technical constraints and Net Present Cost (NPC). Results obtained shows that the base system is with NPC of 166 million, while the current system is with NPC of 51.4 million. The current system was selected which gives an optimal value of each decision variable that satisfies technical constrains at the lowest cost though with a higher capital. The hybrid system consists of 3 kW wind turbine, 3.66 kW converter, 69.1 kWh lead acid battery and a 25kW generator. Over the simulated annual chronological dispatch, the wind turbine gives power output of 5,055 kWh/yr which is 13.5% of the total power output, PV gives 31.092 kWh/yr, which is 82.7% and the annual renewable penetration of the hybrid system is 92.8%. This shows to what extend the telecoms industry can depend on clean and green energy.

**Keywords:** Hybrid system, Wind/PV, Micro-grid, Homer

56

20248006S

**Sound absorption capacity of hot and warm asphaltic mixes modified with waste plastic bottles**

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**Abstract.** Vehicular traffic is one of the noise-producing factors contributing to environmental problems. Utilizing special asphaltic mixes can help reduce noise generation. Thus, this research evaluated the sound absorption capacity (SAC) of hot mixed asphalt (HMA) and warm mixed asphalt (WMA) modified with pyrolyzed polyethylene terephthalate (PET) bottles varying at 1-17 wt. %. PET bottles were pyrolyzed at 450 oC for a 2 h retention period, obtaining pyrolyzed PET bottle (PTB). HMA and WMA were prepared with 0-17 wt. % PTB and the SAC values were tested. The results were compared to a control mix, a standard HMA or WMA without any PTB modification, to provide a baseline for the evaluation. The effects of volumetric and Marshall properties of HMA and WMA on SAC were correlated. The results revealed decreased sound levels with increasing PTB dosage in the HMA. However, WMA generated increased sound levels as PTB content increased from 1-9 wt. % but decreased after 9 wt. % of PTB substitution. HMA and WMA performed best at 11 and 7 wt. % PTB with corresponding SAC values of 78.23 and 80.53 dB compared to the control mix with 79.33 dB.

**Keywords:** Asphalt, Plastic Bottles, Recycling, Sound Absorption, Sustainability, Waste Management

57

20248016S

**SUSTAINABLE FACILITIES MANAGEMENT PRACTICE IN A VOLATILE ECONOMY (A CASE STUDY OF COCOA HOUSE, DUGBE, IBADAN, OYO STATE)**

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**Abstract** This study explores sustainable facilities management (SFM) practices in Cocoa House, Dugbe, Ibadan, Oyo State, aiming to identify key responsibility areas in sustainable operations and maintenance. A purposive sampling technique was employed, targeting the management team of Odua Investment Company, which oversees Cocoa House. Ten closed-ended questionnaires were administered to the Estate Manager, Operations Manager, and Cluster Managers (and assistants) of the building, focusing on their perceptions of SFM responsibilities. Data analysis was conducted using a 5-point Likert Scale, with responses ranked according to Mean Item Scores (MIS). The results indicated that the highest-priority activities in SFM included safety, security, and cleaning (MIS = 5.0), which ranked first. Managing assets, management of

maintenance staff, and equipment inspection were tied for second place with an MIS of 4.9. Tracking the maintenance of facilities and physical assets and the consideration and implementation of sustainable practices both received an MIS of 4.8, ranking fifth. Conversely, the creation, maintenance, and use of facility-specific manuals, along with methods, equipment, and tools, received the lowest scores (MIS = 4.3), indicating areas needing improvement. The findings suggest that while Cocoa House has a robust framework for addressing essential operational areas, there is an urgent need to enhance documentation practices and the integration of sustainability principles. By focusing on these areas, Cocoa House can improve its sustainability performance and serve as a model for effective facilities management in Nigeria. This study highlights the significance of embedding sustainable practices into the core operations of facilities management to achieve long-term environmental and economic sustainability.

**Keywords:** Economy, Facilities, Management, Sustainable, Volatile.

58

20248029S

### **Effect of Route Realignment of Electricity Wayleaves on Right Holders Affected in South-East, Nigeria**

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**Abstract.** The construction of electricity pylons require wayleaves route which could be realigned for several reasons. This often results in a situation whereby right holders of land not initially affected by the project become affected leading to aftermath effects. This paper is aimed at analyzing the effect of route realignment in South-East, Nigeria with a view to easing the impact on them. To achieve this, a hypothesis was put forward: there is no significant difference between the rights holders initially affected and those not initially affected but now affected by realignment of electricity wayleaves, in South-East of Nigeria. The study adopted the use of questionnaires administered on Estate Surveyors and Valuers (ESVs), the representatives of the Revoking Authority (RAs) and Affected Rights Holders (ARHs) in the study areas. It was discovered that ARHs complained that the notice and reason for route realignment was not made known to them, and delay in compensation payment resulting in loss of value of money as well as delayed project construction were seen as the major negative landmark left by realignment besides all other identified after effects. It was further concluded that there is significant difference between the rights holders initially affected and the ones not initially affected but now affected by realignment of electricity wayleaves. It was therefore suggested that it is important for proper regulation of the activities of the executors of such exercise by either the government or a formidable committee formed by the community to monitor activities of realignment closely to curb possible adverse effects that may emanate from it.

**Keywords:** Effect, Route Realignment, Electricity Wayleaves, Right Holders, Affected, South East, Nigeria.

59

20248033S

### CLIMATE CHANGE AND FOOD SECURITY: FRESH INSIGHTS FROM NIGERIA USING A COMPUTABLE GENERAL EQUILIBRIUM APPROACH

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**Abstract.** This study investigated the relationship between climate change and food security in Nigeria from 2018 to 2027, utilizing a Computable General Equilibrium (CGE) model. The findings indicate that food security for various crops is differentially affected by climate factors and policies. Maize experienced a significant decline in food security, with rural households facing a mean short-term reduction of - 0.6808% and urban households a severe drop of - 4.8136%. Over the long term, rural areas saw a slight decline of -0.0096%, while urban areas faced sharper declines, averaging -0.0781%. Rice followed similar trends, showing significant declines in rural areas due to climate change. Root and tuber crops exhibited more resilience but still faced challenges from climate variability, with rural households experiencing a mean decline of -0.6488% and urban households - 1.3285%. Long-term projections indicated a positive spike in rural areas in 2019 (2.6769%) with stabilization, while urban areas experienced a modest increase of 0.4073%. The study recommends prioritizing enhancements in root and tuber crops through climate-smart agricultural practices, to improve overall food security in Nigeria.

**Keywords:** Climate Change, Climate Variability, Food Security, Computable General Equilibrium

60

20248037S

### Renewable Energy for Sustainable Development in Nigeria: Analysing Its Potential Impact on Land Use in Sokoto State

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**Abstract.** This study investigates the potential for solar energy development in Sokoto State, Nigeria, by employing Sentinel-2 satellite imagery and advanced land cover classification techniques. Through a detailed analysis, the research identifies approximately 1,603,218 hectares of bare land suitable for photovoltaic (PV) installations, thereby highlighting a significant opportunity for renewable energy advancement in the region. The classification process delineates five distinct land use categories—Agricultural Field, Bareland, River, Settlement, and

Vegetation—facilitating targeted planning for sustainable energy projects. The land use classification accuracy reached an impressive 92%, validated through comparative analysis with high-resolution imagery, ensuring reliable data for future development initiatives. Sokoto's solar irradiance levels, averaging 5.5–6.0 kWh/m<sup>2</sup>/day, combined with proximity to existing infrastructure, further establish the region as a prime candidate for large-scale solar energy initiatives. This research emphasises the necessity for a robust policy framework, public-private partnerships, and active community engagement to realise the full potential of solar energy in Sokoto. The findings position Sokoto State as a prospective leader in Nigeria's renewable energy landscape, promising enhancements in energy security, economic development, and environmental sustainability while aligning with national and global sustainability objectives.

**Keywords:** Solar, Sentinel-2 Satellite Imagery, Land Use, Renewable Energy, Sokoto

61

20248053S

### **Sustainable Design Strategies for Upcycling Plastic Waste in Gumuruh Village Through Service Learning.**

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**Abstract.** Ecosystems are endangered by the inappropriate treatment of plastic debris, which is a major environmental issue in many nations. In Bandung City, every day over 58.4 tons of plastic packaging waste (PPW) are produced, accounting for roughly 3.76% of all municipal solid waste (MSW). Reusing plastic may reduce waste and the demand for new manufacture while also lowering carbon emissions and the use of natural resources. Recycling also yields significant economic benefits since it creates high-quality commercial items, particularly in the furniture industry. The residents of Bandung's Gumuruh Village recycle garbage, including biological waste, actively in order to produce sustainable items. Using the build Thinking method to Service Learning, academics and local SMEs work together to build products that will be delivered to the community.

62

20248054S

### Implementing Zero Waste Strategies in Biophilic Interior and Furniture Design Using Banana Frond Fibre

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**Abstract.** The banana frond, also called banana stem from *Musa Familia*, is a health benefit to consume and grows well in tropical settings. But a lot of people throw away banana fronds as compost or organic waste since they don't know they can be useful for other purposes. Banana frond fibres might be used as a circular material for paper, natural cloth, and particle board. Usually, they are produced as fabric fibres, with the waste being heated at high temperatures and compressed to create a board. The surplus is then gathered to resemble cotton and piled to create paper. The purpose of this experiment is to determine whether banana frond debris and fibres may be used as finishing materials using a qualitative technique. The objective is to test several configurations in order to identify the one that may produce the best results and provide a sustainable substitute for finishing materials in the furniture and interior design fields as well as zero waste implementation of the banana frond natural fibre materials

63

20248055S

### Eco-Driven Interior and Furniture Innovations for Braille Reading and Writing Accessibility in Inclusive Braille Libraries

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**Abstract.** In the context of Braille reading and writing activities at the Wyata Guna Braille Library in Bandung, this research looks at eco-driven interior and furniture changes meant to improve accessibility for visually impaired users. The need for accessible and sustainable library facilities is enhanced by the 196.20% growth in visually impaired individuals in West Java between 2021 and 2022. This study explores how ergonomic principles and inclusive design elements may enhance visually impaired people' experiences with Braille reading. Using 3D visualizations and mock-ups, the research proposes improvements in furniture design and spatial arrangement to produce more practical and ecologically friendly learning settings. The results offer a design guidance as a foundation for Braille libraries in the future and emphasize the need for environmentally conscious design to meet the needs of blind and visually impaired individuals for sustainable learning while minimizing their adverse impacts on the environment.

**Keywords:** Sustainable Design, Visually Impaired, Braille Library



64

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**Transforming Bamboo Waste in Saung Angklung Udjo into Value-Added Products to Implementing The Zero Waste Principle: A Community Empowerment Initiative Collaboration with Virageawie Workshop**  
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**Abstract.** Saung Angklung Udjo (SAU) is a cultural tourism destination in Bandung City that features angklung music as its main performance. SAU cooperates with local angklung craftsmen who live around the SAU area. In connection with this, SAU faces the problem of handling bamboo waste obtained from the production of angklung. Currently, the handling of angklung production waste at SAU faces two problems, first problem is Temporary Waste Disposal (TPS) that no longer wants to accept angklung production waste from SAU, then the second problem is public rejection of the pollution of waste incineration carried out by angklung craftsmen that is not environmentally friendly. The utilization of angklung production waste has also become an urgent need considering the increasing number of angklung production along with the rapid development of orders and tourist visits to SAU. Efficient waste management is needed to reduce the negative impact on the environment. Therefore, with the background above, a collaborative workshop was held between Virageawie workshop as an expert resource and design students as workshop participants who will produce designs to be used by SAU as one of the solutions in solving the problem of angklung production waste. Hopefully, the selected design can be produced continuously by Virageawie workshop using waste produced by SAU and the final product has a function that is appropriate to the needs at SAU.

**Keywords:** zero-waste environment, sustainable development, bamboo waste, interior element, waste management, empowerment

65

20248062S

## Natural Disaster Mitigation Education Learning Design in Bandung with Interactive Simulation Design Application

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**Abstract.** Natural disasters are caused by various factors such as geographical location and human activities. Moreover, climate change and global warming can also affect the risk of natural disasters. Bandung is one of the cities that frequently experiences disasters, and its impact vary from losses in various sectors to damage, and even casualties. To minimize disasters and its potential impacts, people need a good understanding of the pre, during, and post- disaster situations. The purpose of this design is to create a place about disaster mitigation as a means of educating the public to know how their activities can influence, how to deal with disaster situations and be able to reduce the potential impact. With the application of interactive simulation design, visitors are invited to be actively involved during the learning with new experience. The method used is a mixed method with a combination of literature review, interviews with related parties, as well as observation.

66

20248064S

## The Role of Li-Fi in Renewable Energy Applications: Opportunities and Innovations

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**Abstract.** As global energy consumption grows, so does the need for energy-efficient and secure communication systems in renewable energy applications. Li-Fi (Light Fidelity), a visible light-based communication technology, is developing as a viable alternative to standard radio frequency (RF) systems like Wi-Fi, particularly in areas where RF interference and spectrum congestion are an issue. Li-Fi provides distinct advantages by using LED lights to transport data, such as increased bandwidth, decreased interference, and improved energy efficiency. This article investigates the integration of Li-Fi into renewable energy infrastructures such as solar, wind, and hydropower systems, highlighting how this technology may increase data transmission, security, and promote sustainable energy practices. The study investigates the basic concepts of Li-Fi, its line-of-sight communication benefits, and its applicability in several renewable industries. Li-Fi, for example, might enable data-driven solar panel monitoring, predictive maintenance, and increased system control in wind and hydropower systems. Despite these potential uses, line-of-sight restrictions and environmental constraints limit Li-Fi's deployment range, prompting research into hybrid models that combine Li-Fi and RF systems for increased flexibility. This article emphasizes Li-Fi's importance as a transformational communication technology in improving renewable energy systems and establishing a sustainable, decarbonized energy

environment through an in-depth examination of its benefits, difficulties, and prospective applications.

**Keywords:** Li-Fi, Renewable energy applications, Smart grids, High-speed communication

67

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## Understanding the Relationship between Energy Efficiency, Institutional Strength and Nigeria's Economic Expansion

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**Abstract.** This paper examines dynamic interplay between the efficiency in the use of energy and economic growth in Nigeria towards achieving Sustainable Development Goal-7, while assessing the institutional mechanisms that influence this relationship. Utilizing the Johansen Co-integration approach, rooted in the neoclassical growth framework, the analysis spans the period from 1981 to 2021. To further elucidate the short and long-run equilibrium, a Vector Error Correction Model was employed alongside Causality Test to identify causality and adjustment pathways. Empirical deductions demonstrate a statistically significant interconnected co-integrated relationship, with the consumption of electricity exerting a negative influence on economic growth. This counterintuitive finding suggests inefficiencies in electricity usage or structural bottlenecks in the energy sector, which may be hindering productive economic activity. Moreover, the unidirectional nature between GDP and utilization of electricity relationship, emphasize that economic expansion in Nigeria does not necessarily drive energy consumption patterns. These results underscore the importance of strengthening institutional frameworks to enhance energy sector efficiency, promote sustainable growth, and address the critical gaps in the energy-growth nexus. This study offers valuable policy implications for enhancing economic resilience through targeted energy reforms and institutional development.

**Keywords:** Economic Growth, Sustainable Growth, Energy-Growth Nexus, Institutional Framework

