UNIVERSITY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

# 3RD SUSTAINABLE DEVELOPMENT CONFERENCE

THEME

**Integration of Responsible Production and Consumption into Development Agenda of Developing Economies: Exploring Policies, and Scientific Options**

6TH – 9TH SEPTEMBER

(2023 EDITION)

## Preface

Despite warnings that have been sounded since the Earth Summit Conference in 1992, the quantity of materials used in production and consumption continues to increase globally and the rate of extraction of materials is outpacing population and economic growth, implying that we are using more materials less efficiently (United Nations Environment Programme Report, 2021). If current trends continue, global extraction of raw materials will increase by 110% by 2060. As a consequence, the current unsustainable patterns of consumption and production are responsible for three current global crises: climate change, biodiversity loss and pollution. These three crises threaten the well-being and prosperity of all people by threatening the food we eat, the air we breathe, the water we drink and the materials and resources on which our societies, economies and nations depend, as well as our livelihoods, families and communities. This threat is also unevenly distributed around the world, reinforcing global inequalities and threatening the entire 2030 Agenda (World Bank Report, 2021; UNEP, 2021).

Meanwhile, the United Nations' Declaration of the Sustainable Development Goals (SDGs), and subsequent ratification of the Paris Climate Accord have upscaled, and renewed commitments towards changes in patterns of consumption and production. The SDG 12 calls for a comprehensive set of actions from businesses, policy-makers, researchers and consumers to adapt to sustainable practices. It envisions sustainable production and consumption based on advanced technological capacity, resource efficiency and reduced global waste. The UN explains that "Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic

competitiveness and reduce poverty" (UNEP, 2021). As part of the systemic process to surmount these triple global crises of climate change, biodiversity loss, pollution and waste, Government, Policy Makers, Practitioners, and customers must move toward sustainable patterns of consumption and production. This requires a profound transformation of our economies and societies. A transformation that puts human well-being and the ability of all people to flourish at its core, based on low-carbon, environmentally friendly and resource-efficient consumption and production. In our global and interconnected economic system, the value chains of the goods and services we produce and consume extend across many countries. International cooperation is therefore essential (World Bank Report, 2021; UNEP, 2021).

The shift toward sustainable consumption and production depends on concerted and coordinated efforts across the world and across all sectors of society; policymakers, financiers, business, communities, and individuals must work together at global, national, city, and local levels. This means recognizing the common but differentiated responsibilities of developed and developing countries and the role of developed countries in taking initiatives. It is therefore important to consider not only the use of natural resources and the environmental impact of what a country produces, but also what it consumes. Sustainable consumption and production must therefore take into account the entire value chain of goods and services, including a systematic analysis of the incentives and disincentives for sustainability at each stage of the value chain (World Bank Report, 2021; UNEP, 2021).

**Interventions being Implemented by the Government towards the attainment of SDG 12**

According to Ghana's Voluntary National Review Report (2022) on the Implementation of the 2030 Agenda for Sustainable Development, the following are the interventions being implemented by the government of Ghana towards the attainment of SDG 12.

***These include the following:***

- ✓ In 2019, two recycling facility were commissioned and operationalized in Kumasi and Accra. Government is collaborating with the Private Sector to construct 16 IRECOPs across the country.
- ✓ In 2021, 151 procurement entities were trained on the Ghana Electronic Procurement System (GHANEPS). In addition, 1,268 procurement practitioners were trained in general public procurement management.
- ✓ In 2020, under the "One District One Warehouse Initiative" 42 prefabricated grain warehouses were completed.
- ✓ In 2020, as part of efforts to reduce post-harvest losses, government through the Ghana Agricultural Sector Investment Project (GASIP) constructed 74km feeder roads and farm tracks.
- ✓ In 2020, as part of efforts to reduce post-harvest losses and increase value-addition, 80 "Ahotor" ovens which reduces Polycyclic Aromatic Hydrocarbons (PAH) concentration were constructed and distributed to fish processors.
- ✓ In 2021, under the "One District One Warehouse Initiative" 23 warehouses were completed.

- ✓ In 2019, two recycling facility were commissioned and operationalized in Kumasi and Accra (Ministry of Sanitation and Water Resources Report, 2021; National Development Planning Commission report, 2021).

**Objectives of the 3rd Sustainability Conference**

This conference aims to create opportunity to review and address the constellation of sustainable consumption and production gaps with a focus on; sustainable consumption and production action plans, material footprint, domestic material consumption, global food loss, international agreements on hazardous waste, hazardous waste generation, recycling rates, publication of sustainability reports, national sustainable procurement plans, understanding of sustainable lifestyles, support for developing countries' capacity for sustainable production, monitoring sustainable tourism, and removing fossil fuel subsidies. This inter- and transdisciplinary conference will provide a crucial opportunity for academics (scholars) and practitioners to brainstorm, and discuss recent advancements in sustainable consumption and production recommended policies and strategies. It will provide a platform for building and enhancing connections between research, practice, and policy to increase understanding and action of how to move transformations to sustainable consumption and production forward in Ghana and the rest of Sub-Saharan African Countries. We are herein, calling on all stakeholders to prioritize and participate in this distinguished conference. Interested researchers, academics, and practitioners should respectfully submit their abstract for either oral or poster presentation in respect of the following thematic areas.

**Thematic Areas**:

- ✓ Mobilizing industry for a clean and circular economy;
- ✓ Supplying clean, affordable and secure energy;
- ✓ Building and renovation in an energy and resource efficient way;
- ✓ Accelerating the shift to sustainable and smart mobility;
- ✓ Designing a fair, healthy and environmentally friendly food systems;
- ✓ Preserving and restoring ecosystems and biodiversity;
- ✓ A zero pollution for a toxic-free environment.
- ✓ Global food loss, and international agreements on hazardous waste
- ✓ Hazardous waste generation, recycling rates,
- ✓ Sustainability reports,
- ✓ Sustainable procurement Plans, understanding of sustainable lifestyles, and
- ✓ Removing fossil fuel subsidies

Signature

Vice Chancellor, UESD

**Conference Planning Committee**

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**Organization of abstracts**

The abstracts in this book are organized based on the sub-themes associated with the Conference theme.

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## Sub- Theme 1

# Circular Economy and Health Food Systems

# E-Library And E-Laboratory Experiences Of Undergraduates For Learning In A Ondo State University

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## Abstract

The use of e-library and e-laboratory according to literature has not gained sufficient attention by both science lecturers and undergraduates in Nigeria. Hence, the study investigated student's awareness of the roles of e-library and e-laboratory for learning in a Ondo State tertiary institution. Four research questions and four research hypotheses were raised to guide the study. Descriptive design of the survey type was adopted for the study. A sample of two hundred and five (205) undergraduates was randomly selected across five Faculties of the University. A self-developed questionnaire was the instrument used for data collection. The data collected were analyzed using frequency counts, percentages, mean and t-test. The findings of the study revealed that E-library and E-laboratory is easy to use for students (x = 2.99). Students have positive attitudes to the use of this e-library and e-laboratory (x = 2.97). Result also shows that there is a significant difference in the view of male and female students on the importance of e-library and e-laboratory technology for learning (t-cal (1.769) with p-value (0.078) [$p<0.05$] result also revealed that there is a significant difference in the attitude of male and female about the use of e-laboratory and e-library t-cal (2.854) with p-value (0.005) [$p<0.05$]. The study concluded that though E-library and E-laboratory has positive impacts on undergraduates learning, they still experience difficulty in using them. Recommendation therefore were made to appropriate authorities to encourage the use of E-library and E-laboratory in tertiary institutions.

**Keywords:** Undergraduate, Awareness, E-library, E-laboratory, Learning

# Smart Manufacturing And Sustainable Production In The Ghanaian Manufacturing Industry: A Moderated Sequential Mediation Model

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## Abstract

Smart manufacturing encompasses a category of manufacturing that employs computer-integrated capabilities and technologies to enhance supply chain optimization, production efficiency, and recyclability. The crux of this paper is that to achieve sustainable production among manufacturing companies in the context of developing economy, there is need to develop a baseline model that integrate smart manufacturing, sustainable production, green dynamic capability, and green innovation. This paper aims to examine the implications of smart manufacturing on sustainable production, and develop a baseline model to explain moderated mediation role of green dynamic capability, green innovation and responsible production. This study is anchored on quantitative research approach, deductive reasoning, and explanatory design. Cross – sectional survey data have been obtained from 382 manufacturing companies in Ghana. Our hypotheses have been tested using Structural Equation Modelling and SMART-PLS. The study has revealed that smart manufacturing capabilities and technologies significantly affect sustainable production. Moreover, environmental orientation significantly moderates the relationship between smart manufacturing and sustainable production. Furthermore, the results have showed that green dynamic capability and green innovation mediate the relationship between smart manufacturing and sustainable production. The implications of the study include the identification of conditional variables such as green dynamic capability, green innovation, and environmental orientation and how they affect sustainable production. Moreover, there is an emergence of a baseline model to guide policymakers, practitioners, and academicians to explain the relationship between smart manufacturing and sustainable manufacturing in the context of developing countries. The social implication of the study includes the realisation of decent job and economic growth, responsible consumption and production as well as actions taken to combat climate change.

**Keywords:** Smart Manufacturing, Sustainable Production, Environmental Orientation, Green Innovation.

# Greening The Academic Library: Analysis Of The Effectiveness Of Sustainable Online Services Towards Reducing The Environmental Impact Of Academic Libraries.

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**Abstract**

As institutions across the world become more focused on sustainability, academic libraries are considering ways to reduce their environmental impact. One strategy is the use of sustainable online services, which can reduce the need for physical materials and transportation. This study aims to analyze the effectiveness of sustainable online services in reducing the environmental impact of academic libraries. Using a mixed-methods approach, the survey will be used to solicit information from library staff and users to gather data on their attitudes towards sustainable online services and their usage patterns. A comparative analysis will be conducted on the costs of traditional library services versus sustainable online services. The findings of this study will contribute to the growing body of literature on green academic libraries and provide insights into the potential of sustainable online services to reduce the environmental impact of academic libraries.

**Keywords:** Sustainability, Environmental sustainability, Academic libraries, Green printing, Green copying, online services

# Assessing Risks Of Households Food Insecurity And Foreign Remittances: Evidence From A National Survey, Ghana

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## Abstract

Food insecurity is known to be pervasive and threatening to human survival for many rural people in developing countries. The problem remains unabated despite several efforts fashioned in the erstwhile Millennium Development Goals One (MDGs 1) through to the Sustainable Development Goals Two (SDG 2) aimed at minimizing its risks. The comprehensive food security and vulnerability analysis for Ghana shows that as at 2020, 11.7% of Ghanaians are food insecure resulting in abject poverty in several households. This notwithstanding, remittances are studied as one of the means of mitigating risks of food poverty for many households. It is in this context that our study assessed the effect of foreign remittances in augmenting household food security in Ghana. We relied on 13,866 responses from households' heads interviewed in the Ghana Living Standard Survey (GLSS) 7 series. Data on key variables such as food security status, household remittance status, sex, age and region were analyzed using logistic and probit regression models. Comparatively, we found that households that received foreign remittance have greater probability of escaping food insecurity. This suggests that foreign remittance may help lift households out of food poverty in Ghana. Thus, we recommend policies that promotes and facilitates foreign transfers to poor households in remote areas.

## Key words

Food insecurity, Ghana, Logistic regression, Poverty, Remittance, Risks

# Influence Of Biochar Substrate On A Sustainable Yield And Quality Of Tomato In A Solar Greenhouse

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**Abstract**

Fruit yield and quality of tomato has taken the centre stage in its production and consumption globally. The influence of biochar additions (0, 1.4 and 2.8 % by weight) on tomato (Lycopersicon esculentum) plant yield and quality in a Venlo-type greenhouse was examined. Biochar additions of 0 %, 1.4 % and 2.8 % (w/w) were designated as B 0 , B 1 and B 2 , respectively. Tomato plant development in the biochar-treated soil boxes and plastic buckets were significantly enhanced as compared with the unamended controls. This was reflected by a system-wide increase in the measured plant parameters: plant height, stem diameter, number of flowers per plant, number of leaves per plant, and fruit weight, diameter and length. Tomato plant heights in the biochar amendments were on average 30 % taller than the control treatments. Percentage increases of number of leaves per plant for biochar treatment levels 1.4 % and 2.8 % (w/w) were between 10 to 17 %. Stem diameters (SD) for the 0 %, 1.4 % and 2.8 % biochar rates had percentage increase ranging from 11 %, 20 % and 28 %, respectively. Percentage number of flowers per plant at all biochar treated tomato plants ranged between 11 to 22 %. Mean fruit weight (FW) varied from 57.28 g in the non-biochar treatment (0 %) to 207.72 g in the 2.8 % treatment. Mean fruit diameter (FD) ranged from 4.39 cm in the non-biochar treatment to 7.43 cm in the 2.8 % treatment; with mean fruit length (FL) varying from 4.22 cm in treatment 0 % to 6.18 cm in treatment 2.8 %. The outcome of this study revealed that FW, FD, total soluble solids (TSS), FL, and fruit index (FI), all of which are yield and quality parameters of tomato crop increased in the order: B 0 <B 1 <B 2 . This means that application of biochar to the soil substrate made significant differences to the yield and quality potentials of the tomato crop. Our findings show the considerable potential of exploiting biochar resources in the production of tomato to obtain higher yields with better quality in the greenhouse environment for sustainable agriculture practices. This study adds a new impetus to knowledge about biochar effects on tomato yield and quality.

**Keywords:** Biochar, tomato, fruit yield, fruit quality, greenhouse

# Analyzing A Novel Organic Substrate And Fertilizer Formulation For Sustainable Crop Production

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## Abstract

Food production depends on the quality of the soil to supply crops with adequate essential nutrients. However, managing soil fertility to obtain quality soil has become a global challenge as more chemical fertilizers are being used, which in the long run threatens the soil's health, the environment, and farm produce. To ensure adequate food for the growing population, maintain the fertility of the soil, and create a healthy environment, it is vital to move towards the use of organic fertilizers. These can be produced with local materials that are otherwise considered waste and burned to pollute the environment, thus contributing to climate change variability. This study investigated the nutrient properties of four organic materials and a mixture of these four materials to ascertain their potential for the production of organic fertilizer and substrate. The organic materials are coconut husks (CH), corn leaves (CL), oil palm fiber (OP), and corn stem (CS), and their mixture is dubbed *CLOPS mixture*. Laboratory analysis was conducted to characterize these organic materials, thus testing for Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sodium (Na), Sulphur (S), Zinc (Zn), Iron (Fe), Copper (Cu), Manganese (M), Organic carbon (OC) and Organic matter (OM). The results show the adequate nutrient potential that these organic materials and the CLOPS mixture have to support plant growth. The study recommends the application of the CLOPS mixture to soils and also as a substrate to enhance crop yield.

**Keywords**: Soil fertility, Food production, Food security, Crop health, Climate change

# An Assessment Of The Sustainability Of Eco-Pavement And Concrete Pavement Bricks: A Comparative Study.

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## Abstract

The rapid generation and increase of solid waste has led to adverse impacts on human health, biodiversity and the environment as a result of the growth in industrialization, population and economic development. Reusing some of these solid waste materials to develop beneficial products has become relevant. This project adopted a comparative study aimed to develop and assess the sustainability of eco-pavement bricks against a concrete pavement brick. The project was carried out in Bunso, in the Abuakwa South municipality. The aim of the study was achieved by the construction of eco-pavement bricks and acquiring concrete pavement bricks. Parameters such as; compressive strength test, cost analysis, dimensions, weight and water absorption were used to assess the sustainability of the pavement bricks. Questionnaires were administered to amass information from the public on their willingness to pay for an eco-pavement brick. Data obtained were analysed with descriptive statistics to generate frequencies and it was subjected to binomial logistic regression and Analysis of Variance (ANOVA). In comparing Eco-pavement bricks with the concrete pavement bricks, Eco-pavement bricks shown same dimension and weight as the concrete which served as the control, they had good water holding capacity, high compressive strength and were economically viable based on the cost of production. It was concluded that, they can be used to construct walkways, corridor pathways and walls. Moreover, individuals are willing to pay for the development of an Eco-pavement brick. Finally, to ensure the achievement of a circular economy and environmental sustainability, Eco-pavement bricks are considered as a good course and initiative for solid waste management which should be encouraged and practised by individuals and households.

# An Assessment Of Metal Scrap And Its Environmental Impact In Kano-Nigeria

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## Abstract

Metal scrap recycling is the reusing of metallic items from previously manufactured product. Metallic item is termed as scrap when its useful service period expires or as a result of accident or other misfortunate. Metal is the only material that is successfully recycled without losing its mechanical and physical properties. Likewise, steel industries use about 30% of metal scrap in steel production. Kano state is the second leading industrial state in Nigeria where manufacturing industries both formal and informal are on increase. Collection and disposal of metal scrap is a lucrative business, averagely on daily basis major dealers earn profit of N20, 000 to N50, 000 ($30 - $78). However, the safety and health issues are of great concern to the people involved as no government regulations on handling scrap in the state. The paper studies the business of metal scrap, its environmental impact and safety of the people in involved in Kano-Nigeria with a view to propose safety and health measures for the people and the environment. Government should look into the business of metal scrap and recycling by registration all major dealers and give safety and health regulations to all collection centers, and conducting regular inspection through the ministry of environment.

**Keywords**: Metal Scrap, Public Health, Recycling, Handling, Safety Measures

## Sub Theme 2

## Clean, Affordable and Sustainable Energy

# Planning For Walkable Cities In Africa: Co-Producing Knowledge On Conditions, Practices, And Strategies.

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## Abstract

This study sought to unravel the conditions of the walking environment, and residents lived experiences of walking in two urban neighbourhoods in the Greater Accra Metropolitan Area (GAMA). Drawing on a participatory mapping exercise and a total of 70 community and institutional qualitative interviews, the results revealed that the study neighbourhoods have precarious walking conditions manifested by the absence of road markings, inadequate traffic lights and other road-calming infrastructure such as speed ramps. The results also show that previous and current national and local development plans do little to plan for the walking environment. This study demonstrates the impacts of the failure of planning and policy responses to the walking environment on urban residents. In an important stakeholder engagement workshop involving a total of 40 participants, our study brought academics, institutional representatives and residents from the two neighbourhoods together to discuss the findings and establish a stronger collaborative relationship for designing an equitable and sustainable walking environment. Based on the findings from the qualitative interviews and stakeholder engagement workshop, we therefore recommend a community-based participatory planning strategy for improving walkability conditions.

**Keywords:** Walking, social equity, non-motorised transport, co-production, public engagement.

# The Nuclear Drive Towards Sustainable Development in Ghana

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## Abstract

Unsustainable modes of extraction and utilization of several natural resources around the globe are contributing to the depletion of the world's natural resources, degradation of the environment, and more importantly, the changing global climate. Food insecurity and inefficient power supply are the result of unsustainable production and consumption in the agriculture and energy sectors, respectively. There is a global consensus implicating fossil fuel energy production and consumption as the main cause of the increased atmospheric $CO_2$ concentration and positive radiative force warming up the earth. The amount of $CO_2$ produced when fuel is burned is a function of the carbon content of the fuel. In the same vein, the looming food insecurity in Ghana and many parts of Africa is attributed to post-harvest losses linked to unsustainable and inefficient production and processing techniques. Thus, policies relating to production and consumption in both the energy and agriculture sectors are crucial in addressing climate change, which must be guided by key factors such as efficiency, sustainability, emissions, economics, and environmental impacts. Nuclear power and related radiation techniques such as Gamma Irradiation and Isotope Hydrology have the potential to drive sustainable development in Ghana. While nuclear power provides clean, affordable, efficient, and sustainable energy needs of a country, radiation technology in agriculture and isotope hydrology ensures food sufficiency, water resource management, and clean water production. Nuclear power and radiation technology offer the choice to extract, harness, and process our natural resources to meet our current and later material needs without burdening future generations with a broken environment and associated health and economic crises. This study highlights the potential of these technologies for driving sustainable development in Ghana.

**Keywords:** Nuclear power, gamma irradiation, climate change, sustainable energy, food security.

**Beyond security and reliability of electricity towards sustainable electricity systems**

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**Abstract**

Electricity access in sub-Saharan Africa remains limited. At the same time, electricity disruptions for those connected to the centralized electricity provision channels are commonplace with daily unplanned disruptions resulting from accidents as well as periodic extended periods of load shedding exercises. Consequently, energy policy discourse in the sub-region tends to focus on the goal to universalize electricity access as well as to ensure the security and reliability of supply. Despite recent campaigns for renewable electricity systems, the pressure to universalize access and the need for reliability of supply can sometimes conflict with agenda for sustainability in energy supply and consumption patterns. At the same time, the focus on reliability and security of supply of networked services, tends to overlook alternatives in electricity provision emanating from unconventional heterogeneous infrastructure systems. This article investigates the impact of security and reliability focused energy policy on sustainability dimensions of electricity systems in Ghana. It further investigates the potentials for sustainable electricity provision through renewable energy sources and heterogeneous infrastructure systems. I argue that the overarching focus on security and reliability fails to consider viable alternatives to reaching such goals and thereby also results in sometimes unsustainable outcomes of electricity/energy policy interventions. Thus, calling for reconsideration of policy planning and strategies towards more sustainable outcomes.

**Keywords:** Electricity, energy policy, security and reliability, sustainability, Ghana

# Effects Of Fuel Subsidy Removal On Consumption Behaviour And Socio-Economic Wellbeing Of Salary Earners In Nigeria

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## Abstract

The study examines the effects of fuel subsidy removal on consumption behaviour and socio-economic well-being of salary earners in Nigeria using the theoretical research design. The study is anchored on the Social Exchange theory which views consumption behaviour as a form of social exchange where individuals weigh the costs and benefits of their consumption decisions. The paper observed that the removal of fuel subsidy has remained a controversial issue in Nigeria with strong arguments for and against the policy. What is clear, however, is that this policy has had a significant impact on the consumption behaviour and socio-economic wellbeing of salary earners in Nigeria. The paper identifies some of the changes in consumption behaviour of the populace, occasioned by the removal of subsidy. These include, but not limited to a sharp decrease in disposable income which has led to a significant cut back on spending, inability to eat balanced diet as a result of soaring prices of food items, and inability to afford transportation cost, due to high prices of fuel. Other changes in consumption behaviour resulting from subsidy removal include panic buying and hoarding of petroleum products and food items, increase in demand for alternative sources of energy, and a sharp increase in general cost of living. The paper also observed that the removal of fuel subsidy will likely lead to a decrease in investment and a slowdown in economic growth. The paper concludes that the removal of fuel subsidy has adversely affected the socio-economic well-being of Nigerian workers. As a result of this, it was advocated that the government put in place palliative to cushion the effects of subsidy removal on salary earners. These should include a significant increase in minimum wage of Nigerian workers, prompt and regular payment of salaries, a review of the multiple taxation policy, and the provision of basic amenities such as good roads, access to quality health care, among other things.

**Keywords:** consumption behaviour, fuel subsidy, palliatives, socio-economic wellbeing

## Extended Theory Of Planned Behaviour To Predict Smart Meter Adoption And Energy Saving Behaviour In The Yilo Krobo Municipality

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**Abstract**

According to the United Nations (UN), the world is on track to achieve Sustainable Development Goal 7 by 2030. In Ghana, various governments are trying to increase energy efficiency in the generation, distribution and use of energy through smart grids. Smart grids use advanced communication technologies to exchange information between market participants (generators, market operators and end users) to increase the efficiency of energy production and consumption. A smart meter is an electronic device that measures energy consumption and automatically sends this information to the energy supplier via a wireless network. The comprehensive model of the Theory of Programmed Behavior (TPB) was used as the theoretical framework of the study, which takes into account the two components (affective and cognitive) of energy literacy in relation to this behavior and then adds technological opportunism as a new variable. The aim of this study is to investigate the factors influencing smart meter adoption and household energy saving behaviour in Yilo Krobo Municipality. This study adopted quantitative research approach and survey strategy. The paper randomly selected 444 household heads from the Yilo Krobo Municipality of Ghana. Structured questionnaire was utilized to measure the constructs of the study e.g., TPB constructs, energy saving behaviour, affective and cognitive components of energy literacy, and technological opportunism. Our data analysis has been conducted using SPSS version 25 and Andrews Macro Process. To test the causal relationships in the study Structural Equation Modelling (SEM) has been used. The study has revealed that TPB constructs, cognitive and affective attitude, significantly predict smart meter adoption and energy savings behaviour. The results have further revealed that technological opportunism significantly moderates the relationships between TPB constructs and smart meter adoption. The paper concludes that the extended TPB significantly predict smart meter adoption and energy savings behaviour. The theoretical and practical implications have been discussed in the paper.

**Keywords:** Extended TPB, Smart Meter Adoption, Smart Grid, Energy Saving Behaviour

# Overcoming Energy Transition Gap With Energy Citizenship: An Expanded Value Belief Norm Theory

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## Abstract

Energy citizenship encompasses both the cognitive and behavioural dimensions, emphasizing the recognition of one's responsibility towards climate change, equity, and justice in the context of siting controversies, fuel poverty, and the potential for collective energy actions. The concept of energy citizenship places emphasis on the development of energy consciousness and literacy, alongside the adoption of sustainable energy practices. Energy citizenship has been identified to be the most cost-effective and reliable way of addressing energy transition and climate change issues. Per contra, the potentials of energy citizenship are largely untapped. In order to understand its adoption, our paper builds a theoretical framework based on the well-acknowledged Value-Belief-Norm (VBN) theory to explain household's energy citizenship behaviour. The VBN theory of ecology stipulates that, individuals behave environmentally friendly because their values are shaped by their pro-environmental beliefs and personal norms. We have extended VBN by including habit as an exogenous moderating variable. Relying on the objectivist conception of social reality, we tested our model with data from 395 Ghanaian households using structural equation modelling. The results show that participants who are inclined to higher biospheric values, strongly believe fossil fuel consumption as environmentally harmful. Moreover, the more the participants feel responsible for the consequences of fossil fuel use, the more they feel obligatory and committed to cutdown on fossil fuel usage and dependency. Again, habit significantly moderates the relationship between VBN dimensions and household's energy citizenship behaviour. This paper has implications on energy citizenship an enabler of energy transition and realization of Agenda 2030, Goals, 7and 13.

**Keywords:** Citizenship Energy, Energy Transition, Households Habit Value Belief Norm Theory

# Smart Energy Solution, A Panacea For Electricity Distribution Losses In Ghana

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## Abstract

Over the years, the impact of Technical and Non-Technical Losses on electrical energy consumers has preoccupied the minds of power producers, conveyors, and distributors. This phenomenon has equally featured prominently on the agenda of Consumer Watch-Dogs, Regulators, and Policy Makers, leading researchers to ask the question: How do we arrest this canker of Energy losses to provide affordable and reliable power to consumers? Is Smart Energy Solution the answer? A Smart Energy Solution uses unconventional technology such as Internet of Things (IoT) devices, Artificial Intelligence (AI), and Machine Learning (ML) algorithms, to optimize energy distribution, and also reduce waste. Smart energy solution includes smart meters that can track energy usage in real-time, allowing users to monitor their consumption and adjust their behavior to save energy and money. Smart energy solutions reduce energy waste, lower costs, and minimize the environmental impact of energy that has been distributed. The electricity distribution companies in Ghana are not able to account for over $400 million US dollars every year due to both technical and commercial losses in the electricity distribution network across the country. Therefore, the study examined a qualitative assessment of Smart Energy Solutions in providing an answer to the huge electricity distribution losses in Ghana. The research uncovers some findings through a qualitative analysis of downloaded papers from the Energy Commission of Ghana and the Ministry of Energy to supplement peer-reviewed scholarly literature from google scholar, and Scopus databases. The study revealed that the Electricity Company of Ghana (ECG) for the past twelve years (2009 – 2021) has not been able to achieve the minimum distribution losses of 21% that are required by the Public Utilities, and Regulatory Commission (PURC). As of the year 2021, the distribution losses were 29.84% which comprised 19.29% of non-technical losses and 10.55% of technical losses. Again, the Northern Electricity Distribution Company (NEDCo) during the same period, also, contributed significantly to the losses with an input of 27.29% which was made up of 18.09% non-technical losses and 9.20% technical losses. Overall, the deployment of smart energy solutions in electricity distribution networks is a promising panacea to drastically reduce energy waste, improve grid reliability and resilience, and promote the transition to more sustainable and low-carbon energy systems. Effective smart energy solutions are the main keys required in the electricity distribution network as a panacea for electricity distribution losses across Ghana.

**Keywords*:*** Smart Energy Solutions; Distribution Losses; Electricity.

**Assessing the Triple Bottom Line Implications of Biomass Boilers in the Ghanaian Textile Firms: 'A Sustainability Perspective'**

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**ABSTRACT**

This paper investigates the use of biomass boilers in Ghanaian textile enterprises, utilizing Akosombo Industrial Company Limited (AICL) as a case study. Using the Triple Bottom Line (TBL) approach, the study attempts to examine the economic, social, and environmental effects of using biomass boilers. The goal is to provide insights and ideas that can advance sustainable energy practices in Ghana's textile business. Furthermore, the study dives into the many factors impacting the uptake of biomass boilers in Ghana's textile industry. The research employs a qualitative case study approach, using semi-structured interviews with key informants at AICL. The data collected were analyzed using thematic analysis. The findings reveal that the adoption of biomass boilers at AICL was driven by the need to reduce the cost of production by saving on the fuel source for generating steam and to reduce carbon emissions resulting from Fossil fuels to clean energy. However, the adoption was impeded by barriers such as, getting constant supply of feedstock because the adoption is new in the space and suppliers are now getting to hear about the firm. The location of the firm is far from the feedstock areas thereby increasing the cost of transportation. This study has some limitations, including the use of a single case study and the limited number of respondents. Nonetheless, the study provides insights into the factors that influence the adoption of biomass boilers in the textile firms in Ghana, and provides recommendations for accelerating their adoption. The study recommends that the government should provide financial incentives and technical support to encourage the adoption of biomass boilers in the textile firms. The study also recommends that industry stakeholders should collaborate to share knowledge and expertise in biomass boiler adoption. The findings of this research have practical implications for policymakers, industry stakeholders, and potential adopters of biomass boilers in the textile industry in Ghana. The adoption of biomass boilers has the potential to improve energy efficiency and reduce the carbon footprint of the textile industry, contributing to sustainable development. The research contributes to the literature on the adoption of biomass boilers in the textile industry in Ghana, by providing insights into the factors that influence their adoption. The study also provides practical recommendations for policymakers, industry stakeholders, and potential adopters of biomass boilers in the textile industry in Ghana. By applying the TBL framework, it offers a comprehensive analysis of the economic, social, and environmental dimensions, providing valuable insights for both academia and industry practitioners. The research adds to the limited knowledge on the topic and highlights the importance of sustainable energy adoption in the textile sector.

**Key words:** Biomass boilers, Textile firms, Triple Bottom Line (TBL), Sustainability practices, Renewable energy

# Integration Of Nuclear And Renewables In Sustainable Energy Systems: A Pathway To Achieving SDG 12

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**Abstract:**
The achievement of Sustainable Development Goal 12, centred on responsible production and consumption, hinges upon the urgent need for a clean, affordable, and sustainable electricity supply. This paper delves into the realm of energy systems by exploring the integration of nuclear and renewables, specifically solar and wind, in a hybrid configuration. The objective is to address the escalating energy demands of developing economies while mitigating the adverse environmental impacts. By synergistically leveraging the advantages offered by nuclear power and renewables, this approach emerges as a promising solution to confront the pressing global challenges of climate change, biodiversity loss, and pollution. Hence, a comprehensive examination of the scientific and policy options for effectively integrating these advanced technologies into the development agenda, with a strong emphasis on resource efficiency, waste reduction, and the overarching improvement of quality of life for all stakeholders. By establishing hybrid energy systems that combine the strengths of nuclear and renewables, it becomes possible to capitalize on their respective merits while mitigating their individual drawbacks. Barriers, challenges, critical aspects of policy and regulatory frameworks required to facilitate the seamless integration of these technologies are examined. Ultimately the paper fosters collaboration among governments, policymakers, researchers, and industry stakeholders to expedite the widespread adoption of hybrid energy systems. It emphasizes the need for capacity building, research, and development in advancing clean energy technologies. Collectively, the transition toward responsible production and consumption will eventually pave the way for achieving SDG 12 and propelling humanity towards a sustainable and prosperous future.

**Keywords:** Sustainable Development Goals, hybrid energy systems, responsible production and consumption, clean energy, affordable energy

# Potential Utilization Of Wood Waste As Sustainable Renewable Energy Resource In Ghana

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**Abstract**

This paper explores the potential of wood waste as a renewable energy resource in Ghana, focusing on its feasibility, benefits, and challenges. The research aims to assess the viability of wood waste as a sustainable renewable energy resource and its contribution to Ghana energy landscape. The study examines technical, economic, and environmental aspects of wood waste utilization. The findings reveal that wood waste can be efficiently converted into various forms of energy, such as biomass pellets, biogas, and biochar. These energy products can supplement traditional fossil fuels and alleviate Ghana reliance on imported energy resources. The utilization of wood waste offers job creation, rural development, reduced greenhouse gas emissions, and contributes to waste management. However, challenges such as limited infrastructure, technological barriers, and policy gaps hinder the efficient utilization of wood waste. Addressing these challenges requires collaborative efforts between the governments, private sector, local communities to develop appropriate frameworks. The implications of this research extend to multiple sectors, including energy, environment, and waste management. By embracing wood waste as a renewable energy resource, Ghana can diversify its energy mix and promote a circular economy. This study provides a valuable foundation for policymakers and local communities to develop strategies that promote the efficient utilization of wood waste.

**Keywords:** Wood waste, renewable energy, energy resource, biomass, waste management

## Effectiveness Of A Power Factor Correction Policy In Improving The Energy Efficiency Of Large-Scale Electricity Users In Ghana

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**Abstract:**

Confronting an energy crisis, the government of Ghana enacted a power factor correction policy in 1995. The policy imposes a penalty on large-scale electricity users, namely, special load tariff (SLT) customers of the Electricity Company of Ghana (ECG), whose power factor is below 90%. This paper investigates the impact of this policy on these firms' power factor improvement by using panel data from 183 SLT customers from 1994 to 1997 and from 2012. To avoid potential endogeneity, this paper adopts a regression discontinuity design (RDD) with the power factor of the firms in the previous year as a running variable, with its cut-offs set at the penalty threshold. The result shows that these large-scale electricity users who face the penalty because their power factor falls just short of the threshold are more likely to improve their power factor in the subsequent year, implying that the power factor correction policy implemented by Ghana's government is effective.

**Keywords:** energy efficiency; power factor; regression discontinuity design

## Sub Theme 3

## Biodiversity and Ecosystem Restoration

**Bird Raiding On Rice Fields In Ghana: An Evaluation Of Scoial And Economic Losses.**

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**Abstract**

The incidence of birds raiding rice fields was assessed to identify the species involved in rice raiding, social and economic cost to farmers and the mitigation measures deployed against such incidence. Structured questionnaire was used to interview rice farmers in the Kpong Irrigation Scheme area at the lower parts of Lake Volta in Ghana. Six bird species; *Ploceus cucullatus, Ploceus nigerrimus, Spermestes cucullatus, Spermestes bicolor, Quelea erythrops,* and *Dendrocygna viduata* dominated in rice raiding activities at various stages. Birds' raiding activities occurred throughout the day periods i.e., morning, afternoon and evening with peak periods occurring either, morning and evenings depending on bird species involved and season. The economic loss associated with rice raiding was estimated between 124.61 USD to 186.92 USD which was total overhead costs related to either preventing birds raiding activities. The unintended social cost to farmers also includes absenteeism among school children, inability of affected farmers to attend and participate in family, community and other social gatherings. Various deterrent measures were deployed by farmers as mitigation tools, however, the use of small nets to cover rice fields was considered most effective mechanism to prevent birds from raiding rice grains at various stages. Yet most farmers are not able implement the method due to the high cost involved in procuring the nets and thus, desperately relying on low-tech, low-cost and non-lethal methods which are ineffective and also harmful to birds and the environment.

**Keywords**: Crop-Raiding, Birds, Netting, Lake Volta, Food Security.

# Occurrence And Ecological Risk Study Of Some Antibiotic Residues In The Sunyani Municipality, Ghana

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## Abstract

The aim of this study was to determine the occurrence of five antibiotics (metronidazole, ciprofloxacin, amoxicillin, doxycycline, and chloramphenicol) in dumpsites soil and leachates as well as hospital effluents, sachet water samples, and municipal waterworks samples from the Sunyani Municipality, Ghana. Samples were prepared using a solid-phase extraction method. All extracted antibiotics were analyzed via an HPLC- PDA method. All antibiotics analyzed, except metronidazole, were detected either in soil or water samples. Doxycycline and ciprofloxacin were detected in almost all liquid samples. The investigated hospital effluents had antibiotic concentrations of up to 2.93 mg/L for doxycycline and 4.74 mg/L for ciprofloxacin. The highest concentration of any antibiotic found was 8.76 mg/L of amoxicillin in hospital effluents. The risk quotient (RQs) for the antibiotics studied ranged from 0.0002 to 0.0004 and from 777.05 to 40.98 for algae in hospital effluents and leachates, respectively. Risk quotients computed for antibiotics in the various environmental compartments for algae were in most instances low and medium risk, with few cases of exposure to fish. The results from this study showed that, the presence of these pharmaceuticals could pose a great ecological risk to organisms and possibly other members of their ecosystem with time. There is the need for continuous monitoring of environmental levels of these antibiotics while development and implementation of a suitable remediation program is pursued.

**Keywords:** Risk assessment, Antibiotic resistance, Leachates, Hospital effluents, Dumpsite.

## Pah-Contaminated Sediment Remediation With Activated Charcoal

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**Abstract**

Due to the eco-toxicological effects and hydrophobicity associated with Polycyclic Aromatic Hydrocarbons (PAHs) in an aquatic environment, contaminated sediments are conventionally dredged to meet sediment quality guidelines. Innovative and cost-effective technologies that will effectively remove these contaminants without destroying the ecosystem and human health are ongoing. These approaches involve the remediation of contaminated sediment using carbonaceous materials. The objective of this study was to investigate the effectiveness of activated charcoal (AC) as a remediation material for PAH-contaminated sediment in coastal lagoons through laboratory experiments. Sediment samples were collected from Fosu Lagoon and spiked with a 2.0 ± 0.1 mg/kg total concentration of the 16 priority PAHs two months prior to the experiment. The sediment samples were then treated with different doses of AC (1%, 3%, and 6%) and control (0% AC). The bioavailable concentrations of PAHs in the water and sediment columns were measured after a 28-day experiment using passive samplers and analysed with GC-MS. Results indicated that AC effectively reduced bioavailable PAHs both in water and sediment columns. The reductions in the sediment were significantly ($p<0.05$) higher than those observed in the water column, even in the control. Reduction of bioavailable PAHs ranged from 15.4% to 98.5% in the water column and from 98.1% to 99.9% in the sediment column. The highest reduction was observed at the 1% dose of AC. AC, along with the presence of organic matter, served as binding sites for the PAHs. The efficacy of AC was ascribed to its large surface area and pore structure that easily allows for adsorption. These findings also highlight that its efficacy should not promote the usage of higher concentrations of carbonaceous materials in sediment remediation. The application of AC could improve habitat quality for benthic organisms by decreasing bioavailable hydrophobic contaminants and their toxicity in sediment.

**Keywords:** Remediation, activated charcoal, sediment, PAHs, bioavailable

# Climate-Smart Cocoa Technologies In Cocoa Farming: A Multidimensional Environmental Well-Being Analysis

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## Abstract

Adaptation to the impact of climate change on agriculture has been one of the major concerns of stakeholders in the agricultural sector of many developing economies. Specifically, there is a growing concern about how to assist farmers to develop their adaptive capacity, especially in the cocoa sector. Climate-Smart Agriculture (CSA) is the transformation and reorientation of farming systems to decrease greenhouse gas emissions, boost the adaptive ability of farmers, and improve productivity and income whiles contributing to food security. The cocoa sector in Ghana, in particular, is challenged by the increasing demand coupled with climate change impact. In the midst of this, Climate-Smart Cocoa (CSC), coined out of climate-smart agriculture has emerged to help address the emerging issues to ensure sustainability. Cocoa in Ghana is mainly monoculture that fails to protect soil and water resources and the country's rich ecosystems as well as to provide sustainable livelihoods for farmers**.** Ghana's leading research institute in cocoa, the Cocoa Research Institute of Ghana (CRIG), has recommended several cocoa adaptation measures to farmers since its establishment in 1938. Despite CRIG's CSC recommendations, cocoa production is still on the low side, which raises questions about the adaptive capacities and the effectiveness of the recommendations. The research aims to examine the differential impact of CRIG's CSC adaptation recommendations on productivity, multidimensional environmental well-being, multidimensional poverty, and profit for smallholders in rain-fed cocoa growing areas in Ghana between adopters and non-adopters. The research proposes to investigate the determinants of CSC-recommended adaptation practices using two logic regression functions by employing the instrumental variable (IV) and propensity score matching techniques. Alternatively, the research may estimate the potential impact of the GRIG's CSC-recommended practices on cocoa yield and profit using a difference-in-differences approach (The above method is good if some farmers were randomly selected to use the CRIG's CSC-recommended practices). A potential outcome of this study is the receipt of an improved understanding of the impact of CRIG's CSC-recommended practices on productivity, profit, and well-being. This understanding, backed by empirical evidence, could be instrumental in reforming the formulation of policies for local and community-based adaptive strategies, understanding the barriers, constraints, and needed supports, as well as serving as a contribution of knowledge to help prevent anti-environmental adaptive practices. As the world is geared towards sustainability, this research explores the determinants and impacts of CRIG's CSC-recommended practices on the cocoa sector under rain-fed ecology in Ghana.

# Petrographic And Structural Analysis Of Paleoproterozoic Birimian Granitoids And Associated Rocks Of Boankra Areas In The Kumasi Basin Of Ghana

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## Abstract

The petrographical and structural analyses of the Paleoproterozoic Birimian granitoids of Boankra and its environs in the Ashanti region of Ghana and their associated metasediments have been conducted with the main objective of determining their mineralogical composition and identifying their structures. This was achieved through field mapping and petrography. Fifty-nine oriented rock samples were collected. Based on colour, texture, structure, and location, the rocks were classified and given field names. Out of the fifty-nine rock samples collected, petrographic analysis was done in the laboratory for twenty-three (23) of them. From the fieldwork and laboratory findings, the granitoids have been classified into two-mica granite and granodiorite. Metasediment found in the area was mainly identified as biotite-muscovite schist. The geological structures identified in the study area include foliation, shear zones, minor faults, joints and fractures, minor folds, dikes, and veins. The rocks in Boankra and its surrounding areas in the Ashanti region of Ghana in the Kumasi basin can be said to contain new evidence of passing through three phases of deformation. They are D1, D2 and D3. The paper concludes that the Paleoproterozoic Birimian granitoids and associated rocks of Boankra area are similar to the rocks from the north-eastern part of the Kumasi Basin, as such more studies should be done on the rocks in the other parts of the basin for a firm conclusion to be drawn on the mineralogical composition and the structural database of all the rocks in the Kumasi Basin.

**Keywords:** Petrography, Granitoids, Metagranodiorite, Metasediment, Paleoproterozoic, Birimian rocks

## An African Ecocritical Consciousness: A Reading Of Amma Darko's Faceless

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### Abstract

In Faceless, Amma Darko creates ecological consciousness through the representation of human and non-human forms, and their responses to the environment or nature. This study contributes to debates on the global ecocriticism, which ostensibly finds its origins in the Anglo-American literary tradition. In understanding the pivotal role environment plays in literary studies, this study explores how Darko presents the concept of displacement in a typical Ghanaian environment with Accra setting as a case in point. Through a qualitative content analysis, the study looks at issues on ecocultural imaginaries and analyses how culture and environment conflict in the novel, Faceless. It also unveils the correlation that exists between humans and nonhumans and the changing environment as symbols of the African environment. The findings of the study reveal the relevance of environmental sensitivity in the way Darko portrays the orientation of her characters on environmental issues and how it impacts the surroundings and the population. The paper concludes on the benefits of environmental sustainability and the need to promote consumption and production in the lives of the citizenry. The study further initiates debates on the relationship between the role of ecocritical thoughts and Ghanaian consciousness.

**Keywords:** Ecocriticism, Amma Darko, Faceless, Environmental sensitivity, Ecoculture

## Getting Ahead of The Threat'

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**Abstract**

There is an existential urgency to transition to climate friendly renewable energy systems. Mining is already threatening many protected areas across Africa. This transition will mean that new materials like copper, aluminium, cobalt, lithium will have to be mined, because renewable energy production does not rely on fossil fuels. As renewable energy is currently nearly 30% of world energy production (IEA) there will be significant increases in production of these materials to meet global commitments for fossil fuel phase out. Recent published studies in 2020, mapped mining areas across the world to identify the extent that they coincided with biodiversity conservation sites. Mining potentially influences 50 million km2 of the Earth's land surface. The study found that, not only do the majority of mining sites (82%) target materials needed by the renewable energy industry, but further that 8% of mining locations coincided with Protected Areas, 7% with Key Biodiversity Areas, and 16% with Remaining Wilderness. Mining threats to protected areas and biodiversity will increase as more mines target materials for the growing renewable energy sector. There is a need to plan strategically for this present and growing threat to biodiversity and protected areas to ensure it does not become greater than the climate change threat itself. Furthermore, as protected areas are also often important carbon stores, damaging them by mining will exacerbate the very threat that the renewable energy sector seeks to mitigate.

**Thematic Area:** Biodiversity and Ecosystem Restoration

# Teacher's Opinion On Influence Of Security Education On Environment And National Resources

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## Abstract

This paper takes a critical look at the impact of Security Education on environment and natural resources for the benefit of present and future generation. Nigeria as a nation and the giant of Africa properly called is blessed with both human and natural resources. The irony of the situation is that majority of Nigerians are suffering in the midst of surplus on account of poor environmental management strategies, security challenges, misplaced priorities, corruption, ethnicity, insincerity among others. Few political leaders are enriching themselves at the expense of the poor helpless citizens who are wallowing in abject poverty on daily basis. It is against this background that the researcher intends to find solution to this challenge via security education. The research design for the study was descriptive survey, the research instrument was structures questionnaire, administered to a sample of three hundred (300) respondents that were analyzed using mean and standard deviation inferential statistics. The findings of the study revealed that security education has impact on wellbeing of Nigeria citizens. Problems faced by Nigerian's education include; poor funding and implementation strategies. The study therefore recommended that Nigerian government should increase her budgets on education. Additionally, government should educate Nigerians on how to interact with their immediate environment without causing harm to the mother earth.

**Keywords:** Security education, Environment, Natural resources, Present, Future generations.

# The Efficiency Of Satellite Automatic Identification System (Sat-Ais) Device For Monitoring Small Scale Fisheries In Ghana

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## Abstract

This study employed Satellite Automatic Identification System (Sat-AIS) (Sat-AIS) to monitor the activities of artisanal tuna fishing canoes in Ghana. Class-B transponders were mounted on two wooden canoes operating from Albert Bosomtwe Sam fishing harbour, and their activities monitored over a period of six months. The canoes were mainly involved in the harvesting of tuna off the coast of Ghana. The results indicated that skipjack (*Katsuwonus pelamis*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*) and frigate tuna (*Auxis thazard*) dominated the species landed during the study period. Based on the analysis of the speed profiles from the canoe trajectories obtained from AIS data, speeds between 2 knots to 4.3 knots was classified as fishing speeds for canoe fisheries. Findings from this study suggest that Sat-AIS, augmented by a Class-B transponder could be a useful tool in fisheries management for the small scale fishing fleet in Ghana. Based on the findings of this study, it was recommended that the central government should legalise and make it mandatory for all small scale fishing fleets to have the device to enhance surveillance, monitoring and control of small scale fisheries in Ghana.

**Keywords**: Automatic Identification System, Transponder, Monitor, Tuna, Ghana

## Harnessing Genomics As A Tool For Biodiversity Conservation

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As man increases in its activity in a bid to make the environment more suitable for mankind. These activities have increased the threat against biodiversity conservation, as several organisms which contribute to maintenance and balance of the ecosystem are forced into extinction. Genomics emerged as a promising tool in the field of molecular science and its use in conversation science is underexplored. Therefore, this study explores the multifaceted applications of genomics in biodiversity conservation and highlights its potential to promote conservation strategies. In achieving these, we implore a holistic review approach. By integrating findings from existing literature and research papers, that highlights the applications of genomics in biodiversity conservation and sustainable development. Additionally, studies that shows the integration of genomics into conservation science and the characterization of genetic diversity within species, individuals, and populations were also considered. The study indicated that with the adoption of genomics tools in conservation biology can aid in reversing environmental destruction caused by human activities, and natural disaster. By leveraging high-throughput technologies, genomics can assist in quantifying the status quo of global ecosystems, assessing the rate of biodiversity loss, and informing wildlife conservation efforts. Moreover, genomics facilitates the identification of loci responsible for adaptation to local conditions and promote translocation strategies for threatened populations. Harnessing genomics as a tool for biodiversity conservation and sustainable development presents immense opportunities to enhance our understanding of genetic diversity and facilitate effective conservation strategies, which support the long-term aim of biodiversity conservation and sustainable development.

**Keywords**: Genomics, Biodiversity, Conservation Science, Genetic diversity, ecosystem

# Petrographical Studies On The Basin Type Granitoids Of Agyaemmakrom Areas In The Kumasi Basin Of Ghana

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## Abstract

The Paleoproterozoic Birimian granitoids of Agyaemmakrom and its surroundings in the Ashanti region of Ghana have undergone petrographical studies with the main aim of establishing their mineralogical composition. Field mapping and petrography were used to achieve this. Samples of 36 oriented rocks were gathered. The rocks were categorized and given field names based on their location, colour, texture, and structural characteristics. They received sample IDs and were put in sample bags with names that matched the identities. Twenty (20) of the thirty-six rock samples were subjected to thin-section petrographic examination in the lab. The granitoids have been grouped into granodiorite and syeno-granites based on laboratory analysis. The study comes to the conclusion that the rocks from the north-eastern part of the Kumasi Basin are comparable to the Paleoproterozoic Birimian granitoids of the Agyaemmakrom areas. In order to form a clear conclusion on the mineralogical composition of all the rocks in the Kumasi Basin, further research needs to be done on the rocks in the other areas of the basin.

**Keywords:** Birimian, Granitoids, Granodiorite, Paleoproterozoic, Petrography

# Characterization And Rp-Hplc Method Development Of A Biomarker (Bergenin) From The Roots Of *Securinega Virosa*

Amenu J. D., Ayensu, I., Bekoe S. O. and Yamoah A.

## ABSTRACT

The quality of the roots of *Securinega virosa (Euphorbiaceae)* commonly marketed in Ghana for medicinal purposes needs to be assured through standard quality control procedures. This study aimed to identify and characterize a biomarker that can be used to assess the quality of products and herbal preparations containing *S. virosa* roots. The biomarker, identified as Bergenin, was isolated and characterized from a 20 g ethanolic extract of the roots using column chromatography. The characterization of the biomarker was done using melting point determination, UV-Vis, IR, MS, 1D and 2D NMR spectroscopy, and comparison to existing literature. A Reverse-Phase High-Performance Liquid Chromatography (RP-HPLC) method was developed and validated for the quality control of *S. virosa* root preparations, with Bergenin serving as the standard. The most appropriate resolution was achieved by employing a gradient elution of methanol and 0.05% v/v trifluoroacetic acid in water, using a Waters Bondapak C18 column (3.9×300 mm, 5 μ) at a flow rate of 1.0 ml/min and a detection wavelength of 220 nm. The retention time of the biomarker was determined to be 14.20 ± 0.01 minutes. The method was validated according to the International Council for Harmonisation (ICH) guidelines and exhibited good linearity, with a correlation coefficient (r) of 0.9993. The limit of detection (LOD) and limit of quantification (LOQ) were found to be 15.23 mg/L and 46.16 mg/L, respectively. The method demonstrated acceptable levels of accuracy, precision, specificity, and robustness. Using the developed RP-HPLC method, the study estimated the presence of 0.465% w/w Bergenin in *S. virosa* roots. Consequently, this method can be employed for quality control purposes in products containing *Securinega virosa* roots.

**Keywords:** Bergenin; characterization; HPLC; method development; *Securinega virosa*.

# Impact Of Security Education On Environment And Natural Resources For The Benefits Of Present And Future Generations

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## Abstract

This paper takes a critical look at the impact of security education on environment and natural resources for the benefit of present and future generation. Nigeria as a nation and the giant of Africa properly called is blessed with both human and natural resources. The irony of the situation is that majority of Nigerians are suffering in the midst of surplus on account of poor environmental management strategies, security challenges, misplaced priorities, corruption, ethnicity, insincerity among others. Few political leaders are enriching themselves at the expense of the poor helpless citizens who are wallowing in abject poverty on daily basis. It is against this background that the researcher intends to fund solutions to these challenges via security education. The research design for the study was descriptive survey, the research instrument was structured questionnaire, administered to a sample of three hundred (300) respondents that were analyzed using mean, standard deviation and inferential statistics. The findings of the study revealed that security education has impact on well-being of Nigerian citizens. Problems faced by Nigerian education include poor funding and implementation strategies. The study therefore recommended that Nigerian government should increase her budgets on education. Additionally, government should educate Nigerians on how to interact with their immediate environment without causing harm to the mother earth.

**Key Words:** Security education, environment, natural resources, present, future generations

# UV-Spectroscopic Fingerprint As A Rapid Quality Control Tool For Alcoholic Herbal Drinks Sold At Pubs And Clubs In Somanya

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**Abstract**
Alcoholic herbal drinks are made up of one or more different kinds of medicinal plants along with additives. Many people all across the world are becoming increasingly accustomed to this kind of preparations. The quality of these herbal drink's compositions must be preserved in light of the rising usage. As a result, it is necessary to do develop a simply and rapid methodologies for use in the quality evaluation. The aim of the study was to develop a simple, rapid, selective, precise and economical UV-spectroscopic method for the quality assessment of three common alcoholic herbal drinks sold at different locations in Somanya. The study was evaluated some physical properties such as pH, conductivity, density and temperature of the drink. Although we observed a varying physical property among the sampling locations, the UV- spectra analysis revealed a similar fingerprint within a specific alcoholic herbal drink manufacturer. This proposed method can thus be used for the regular analytical study of herbal drink formulations.

**Keywords:** UV-spectroscopy, alcoholic herbal drink, quality control

## UV-Spectroscopic Fingerprint As A Rapid Tool For The Quality Control Analysis Of Herbal Medicines Sold In Somanya.

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**Abstract.**
The use of plants as medicine has become popular among the majority of people worldwide with over 80% using them for their fundamental medical needs. Plants are used to treat pains, microbial and parasitic infections, infertility, cancer, prevent dementia and to enhance cognitive processes, among others. Maintaining the quality of these herbal products are essential considering the rapid growth in consumption. Thus, rapid analytical methods are needed for the standardization of herbal medicines and products on the market. The aim of these study was to design a straightforward, quick, accurate, and affordable UV-spectroscopic method for the quality control of herbal preparations sold in three different markets in Somanya. Combining extraction and spectroscopy methods, a fingerprint of herbal medicine was developed by our group. In addition to the fingerprint development, we assessed the pH, conductivity, refractive index, melting point, and density of the sampled herbal medicines. We will discuss in details our research findings and future perspective at the conference.

**Keywords:** Herbal medicine, UV-spectroscopic, standardization, liquid extraction, physical Parameter

## Sub Theme 4

## Production, Consumption Behaviour, Gender and Socio-economic Development

# Assessing The Determinant Characteristics For Selection Of Cement For Manufacturing Of Sandcrete Blocks.

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## Abstract

The construction industry is a vital sector of Ghana, with sandcrete blocks being one of the building materials. Pozzomix cement has come as an alternative to Ordinary Portland Cement (OPC) in the market. The specific objectives of the study is to review literature on economic benefits and carbon dioxide (CO2) emission of OPC and pozzomix cement by comparing the material cost and emission reduction ratio of both cements from literature. OPC is currently Gh₵90.00- Gh₵95.00 and pozzomix cement is GH₵80.00 in the local market at Fumesua near Kumasi in the Ashanti Region. It was found that there was 11% reduction in material cost for building two and three bedroom houses respectively and 10-30% reduction in Carbon Dioxide (CO2) emission rate in the use of pozzomix cement as compared to OPC. Economic benefits and eco-friendly nature of pozzomix cement are the strong determinants that makes the pozzomix cement an alternative and as a way of contributing to achieving six of the Sustainable Development Goals (SDGs). Nationwide awareness creation on its sustainability and economic viability and environmental impact are the various advantages pozzomix cement offers over the influx of different Ordinary Portland cements in Ghana.

**Keywords:** sustainable construction, sandcrete blocks, pozzomix cement, CO2 emission and building material cost.

## Knowledge Acquisition on Africa through African and Gender Studies Curriculum: Black/African Tertiary Students' Perceptions and Outcomes in a Developing Context (Ghana)

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**Abstract**

This paper seeks to improve the discourse of African Studies by taking a retrospection of an introductory course at a public tertiary institution in Ghana (West Africa). This paper aims to investigate the course's outcomes and understand how students perceive African and Gender Studies. A qualitative research approach was adopted to gather data from 50 Black/African students who took an African Studies course during the 2022–23 academic year. The qualitative data were subjected to thematic analysis. The study discovered that students were able to relate the course to themselves and their respective disciplines from Afrocentric and gender viewpoints which will enable them to contribute the knowledge and skills that they learned to the creation of a sustainable Africa. Moreover, it made it easier for them to connect with their classmates since it taught them to treat everyone fairly and reject sexism. Students also benefitted from the course delivery methods such as group activities, multimedia, and art performances that provided room for greater idea exchange, engagement, discussion, and conceptual clarity while ultimately providing students with the opportunity to gain practical knowledge about the African continent and the African people.

**Keywords:** Africa, Gender, Black/African, Curriculum

## Women Paticipation In Drumming In The Northern Region Of Ghana

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**Abstract**

This study specifically explored the cultural, social and spiritual factors that deter women from participating in traditional drumming practices in Bawku Natinga. Data was collected through in-depth interviews and observational studies with 30 selected members of the Bawku-Natinga community. The study revealed the community's beliefs regarding women's participation in drumming, highlighting the spiritual connotation of drums, the perceived adverse effects of women touching drums and the embedded gender roles that influence these activities. The study not only uncovered the underlying reasons behind the lack of females participation in drumming but also proposed tangible strategies to challenge these entrenched beliefs , thereby promoting gender inclusivity in Bawku-Natinga's cultural practice.

**Keywords:** drumming, rituals, customs, gender, spiritual and connotations.

# Impact Of Natural Fibres On The Properties Of Fibre-Reinforced Cementitious Composites

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## Abstract

Studies on the potential of using natural fibres to enhance mass concrete due to its brittleness are documented in the literature. However, the natural fibre-reinforced concretes studied centred on Jute, Kenaf, coir performance, etc., neglecting natural sponge fibre-reinforced concrete (NSFRC). For property purposes, the concrete should provide the necessary strength and durability for structural benefits. Hence, this study aims to evaluate the properties of concrete containing Distilled water ($D_w$) and NaOH (N) treated natural sponge fibre (NSF) and the potential of the composites for structural application. Experimentally, concrete was prepared with and without treated NSF of 0.00%, 0.75%, 1.00%, and 1.25% by weight of cement. The effects of treated NSF on the fresh and hardened properties of NSFRC were assessed. Scanning electronic microscopic (SEM) was used to examine the effects of treatments. It was found that the NSF surface was well cleaner and rougher after the N-treatment. The strength and durability properties of the N-treated NSFRC composites improved, while the workability was reduced than the $D_w$-treated NSFRC and the control concrete. The increase in strength and durability properties and the reduced workability are linked to the adequate bonding of N-treated NSF and matrix due to the treatment. The strain at peak stress ($\varepsilon_2$) of N-treated composite was more than 0.002 for conventional concrete. Also, the SEM validation provides interesting information backing the mechanism, which led to the performance of this study. In conclusion, the N-treated NSFRC composites indicated a strength that makes them a potential construction material for structural applications.

**Keywords:** Natural sponge fibre reinforced concrete, Mechanical properties, Construction material, Treatments.

# Evaluating Workplace Performance Of Graduates From Vocational And Technical Education Programs At Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria.

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## Abstract

The objective of this scholarly study was to evaluate the workplace performance of graduates who completed Vocational and Technical Education at Adekunle Ajasin University in Ondo State. The researchers employed a descriptive survey research design and randomly selected 120 respondents from a pool of 200 graduates. The study specifically focused on graduates who had completed their education within the past five years. Data was collected using a 12-item questionnaire, and the reliability of the instrument was assessed using the Pearson product moment correlation coefficient method. The questionnaire demonstrated a high level of internal consistency, with a reliability coefficient of 0.86. The study's findings revealed that graduates who had completed Vocational and Technical Education at Adekunle Ajasin University exhibited inadequate workplace performance. To address this issue, the researchers recommended that tertiary institutions prioritize the effectiveness and efficiency of hands-on training. By enhancing the practical skills and knowledge of graduates, they can improve their workplace performance and make a more effective contribution to the labor market. The study involved various technical units in both the private and public sectors. To further strengthen the research, future studies could consider conducting a comparative analysis between graduates from Vocational and Technical Education and those from other educational streams. This would provide a more comprehensive understanding of the factors that influence workplace performance. Conclusively, this study is situated within the broader theme of vocational and technical education and its impact on graduates' workplace performance.

**Key words:** Vocational and Technical Education, Workplace Performance, Graduates

## Industry 4.0 Capabilities And Sustainability Of African Continental Free Trade Agreement: The Role Of Digitalization Orientation And Organizational Ambidexterity

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**Abstract**

African Continental Free Trade Agreement (AfCFTA) is one of the flagship programs which forms an integral part of the broader African Union (AU) agenda 2063 for African Sustainable Development, with the aim of creating a single continental market of approximately 1.3 billion people and a total GDP of approximately $3.4 trillion by covering important sectors of the African economy, such as digital trade and investment protection. The AfCFTA is the largest free trade area in the world, comprising 55 AU countries and eight (8) Regional Economic Communities (RECs). AfCFTA seeks to remove barriers to trade in Africa and significantly increase intra-African trade, especially value added in manufacturing and trade between all sectors of the African economy. This paper aims to determine the extent to which industry 4.0 capabilities affect AfCFTA sustainability, and develop a baseline model to enhance the implications of industry 4.0 capabilities on AfCFTA sustainability through digital orientation and organizational ambidexterity. This paper adopts objectivism ontology, positivists' epistemology, and quantitative methodology. The study's population comprises Medium Size and large sized Companies operating under Ghana Enterprise Agency and Ghana Export Promotion. Smart Partial Least Square (SMART-PLS) version 3.8.9 and Structural Equation Modelling (SEM) analytical instrument have been used to conduct the data analyses and testing of hypotheses. Our symptomatic results have showed that industry 4.0 capabilities exert positive and significant influence on AfCFTA sustainability. The results have further showed that digital orientation and organizational ambidexterity significantly mediate the relationship between industry 4.0 capabilities and AfCFTA sustainability. The main implication of this paper is the development of a baseline model which could be used as decision-making instrument by policymakers, Investors, AfCFTA consultants and Facilitators to predict AfCFTA sustainability in the era of industry 4.0. Moreover, the paper has identified contextual variables (e.g., digitalization orientation, organizational ambidexterity) that influence AfCFTA sustainability and the accomplishment of SDGs 8, 12, and 13 in lower resource context.

**Keywords:** AfCFTA Sustainability, Industry 4.0 Capabilities, Digitalization, Organizational Ambidexterity

# Social Commerce And Small Business Sustainability: An Extended Toe Model With Social Capital Theory

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## Abstract

The United Nations General Assembly has expressed its intention to harness the capabilities of social commerce (S-commerce) as a means to promote trade in accordance with the internationally agreed development goals and sustainable development agenda by the year 2030. Nevertheless, it is imperative to acknowledge that this particular endeavour possesses the capacity to expedite advancements across the entire spectrum of the 17 Sustainable Development Goals (SDGs). A number of these objectives are inherently intertwined with the realm of electronic commerce. The realm of digital commerce and e-commerce harbours immense potential in fostering the creation of respectable employment opportunities, facilitating productive endeavours, nurturing entrepreneurial spirit, fostering innovation, and cultivating creativity, all in the pursuit of sustainable business practices. It is against this backdrop that the current paper aims to draw on Technology Organization Environment (TOE) and Social Capital theory to build a structural model to encourage S-commerce adoption and sustainability of Small Business with a focus on generation Z (born between 1997 and 2012). The paper utilizes quantitative research approach, explanatory design, and a survey - based questionnaire. Partial Least Square (PLS) technique has been used to conduct the analysis. Our mediating analysis has been performed using bootstrapping suggested by Hair et al. (2013). Our results suggest that technological, organizational, and environmental considerations are vital in S-commerce adoption. Furthermore, the S-commerce adoption mediates the relationship between its determinants and sustainability performance of small business. These results have implications and sustainable production and consumption and social sustainability within the context of Zoomers.

**Keywords:** Social Commerce and Small Business, Sustainability, TOE Model, Social Capital Theory

# Comprehensive Action Determination Model And Low Carbon Consumption Behaviour: A Chain Intermediary Effect Analysis

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## Abstract

Low-carbon consumption behaviour pertains to the actions undertaken by consumers to mitigate carbon emissions through the adoption of practices that prioritize minimal energy usage, pollution, and emissions throughout the entire consumption cycle, encompassing the stages of acquisition, utilization, and disposal. Although, numerous studies have been conducted in the past employing various models, primarily the norm activation model (NAM) and the theory of planned behaviour (TPB), however none of these models in isolation have successfully provided a comprehensive understanding of the multitude of factors that impact pro-environmental behaviours. It is with this background in mind, that this paper aims to adopt a Comprehensive Action Determination Model (CADM) which focus on situational, normative, intentional and habitual to develop a structural model to explain low carbon consumption behaviour in a resource constraint context. This paper is premised on quantitative research approach. Survey instruments have been used to garner data from 545 households in the Greater Kumasi Metropolitan areas on sustainable energy consumption behaviours. Our hypotheses have been tested using the structural equation modelling technique. The results have showed that that social norms, personal norms, awareness of needs, awareness of consequences, and perceived behavioural control have positive and significant effects on habits and intentions towards low carbon consumption. Moreover, habit and intentions significantly mediate the relationships between the normative factors and low carbon consumption. Again, situational considerations significantly moderate the relationship between intention towards low carbon consumption and sustainable energy consumption behaviour. By contrast, personal situation factors have no significant effect on low carbon consumption behaviour. The paper has implications on building a structural model to encourage low carbon consumption behaviour in low resource setting.

**Keywords:** Comprehensive Action Determination Model, Low Carbon, Consumption Behaviour

# Taxation And Sustainable Development In Developing Economy: A Research Synthesis For Resilient And Adaptive Economy

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## Abstract

In its 2015 declaration, the United Nations argued that the world is at a time of immense challenges to sustainable development, in terms of people living in poverty and are deprived of a dignified existence within and across nations with increasing disparities. The depletion of natural resources and the negative effects of environmental degradation also contribute to and intensify humanity's list of challenges. While acknowledging that climate change challenges are exerting further pressure on governments to develop measures to prevent environmental damage, there is also a need to aim at minimizing its adverse effect on economic growth. Governments may therefore need to use a variety of instruments, of which taxation is one. This study discussed how taxation could be used to shape taxation policies, laws and regulations in such a way that sustainable development can be assured. The study hinged on the Double Dividends Theory to offer a model analysing taxation as effective tool to address the Sustainable Development Goals (SDGs) by ensuring environmental conservation, social inclusion, peace, and partnership among stakeholders while guaranteeing economic growth. Recommendations were offered to major stakeholders based on the findings.

**Keywords:** Environmental conservation, Ethical taxation, Peace, Social inclusion, Sustainable Development Goals

## A Stochastic Analysis Of Public Debt Stock And Debt Sustainability In Ghana

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**Abstract**

The rising levels of Ghana's public debt has raised concerns about the country's ability to expand its productive capacity to achieve its growth and developmental agenda. As at November 2022, the total debt stock of Ghana stood at GHS 575 billion, which represents 93.5 of its Gross Domestic Product (GDP) and this is expected to increase by 5% by the end of 2023. The thrust of debt sustainability is the ability of a country to generate future foreign and domestic revenue to service these debts. This paper aims to analyze the public debt of Ghana over the period 1960 to 2022 and determine the ability of the country to service its debts for the next ten years without negatively affecting the goals of economic growth and development using a stochastic process. Specifically, it simulates how changes in macroeconomic variables such as borrowing costs (domestic and foreign), exports, domestic revenue and external shock affect debt sustainability; and predicts Ghana's ability to service its debts in future. The paper seeks to use Monte Carlo simulation analysis and data on debt and debt sustainability measures from the Bank of Ghana, World Bank, IMF and World Development Indicators for the analysis. The finding of this study will bring to light areas policy bearers must focus its productive capacity on in order to generate revenue in future in the face of changes in some macroeconomic variables to service its growing debt without compromising its growth and development agenda.

**Keywords** Public debt, debt sustainability, Ghana

## Access Versus Productivity: Marketing Mangoes In The Yilo Krobo Municipality, Ghana

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### Abstract

Farmers' access to market is projected as one of the interventions that leads to the attainment of the United Nations Sustainable Development Goal 2 aimed at ending hunger and promoting sustainable agriculture. However, mango farmers who form majority of the farmers in the Yilo Krobo Municipal area are predominantly poor and unproductive mainly because they are not directly involved in the value chain and marketing of their produce. This leaves them with scanty income, limited access to credit and high transaction cost. Given the potential of the agricultural sector in reducing poverty, studies proffer ready market and information to farmers to enhance their productivity. This study therefore relied on logistic regression analysis to examine the influence of farmers' access to market on their productivity in the Yilo Krobo Municipality, where little is known about the effect of access to markets on farmers' output. Preliminary findings show that farmers with access to market are more likely to reduce the productivity gap than those who do not have access to market. The study recommends the establishment of adequate markets and linkages with produce buying organizations by the Municipal Assembly for farmers to have direct access to the value chain and marketing of their outputs.

**Keywords:** access, farmers, market, mango, productivity

## Role Of Non-Governmental Organizations In Promoting Sustainable Lifestyles In Water Production And Consumption

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**Abstract**

Unarguably, Sustainable Production and Consumption (SCP) is a crucial objective within the context of sustainable development, as it endeavours to harmonize the economic, social, and environmental dimensions of natural resource sustainability within a given nation. Water is a natural resource that is recognized for its unsustainable production and consumption patterns, which are predominantly propelled by the world growing population. Non-governmental organizations (NGOs) have emerged as prominent actors in the pursuit of water sustainability, contributing substantially to the establishment of a more sustainable global environment in addition to national and international government policies and strategies. Despite the efforts of NGOs, their programs and initiatives do not effectively promote sustainable water-related lifestyles over the long term. This paper aims to examine measures put in place by Sustainable Development Focus-Ghana (SUDEF-Ghana), a non-governmental organization specialized in water, sanitation and hygiene in the Bono region of Ghana, to promote sustainable lifestyles in sustaining water production and consumption. The paper is anchored on subjective ontology, interpretivist epistemology and qualitative approach. N-vivo 11 would be used to conduct the content and thematic analyses. The paper expects to discover practices that do not conform to the sustainable consumption and production assumptions. Besides, the paper is expected to reveal the strength and weakness of measures used in promoting sustainable lifestyles in water production and consumption. This paper has implications on SDG 3, and 6.

**Keywords:** Sustainable lifestyles, Water, Production, Consumption, Non-Governmental Organizations.

# Internet Of Things: Affordance In The Continued Usage Intention Of E-Resources Via Household Internet Access Among University Students And Faculty.

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## Abstract

The purpose of this study is to investigate the impact of Internet of Things (IoT) affordances on the continuous usage intention of e-resources obtained via household internet among university students and lecturers. Understanding the influence of IoT technology on the long-term usage of e-resources is critical as technology becomes more incorporated into everyday life. The research aims to investigate the affordances provided by IoT in terms of convenience, connectivity, and accessibility, as well as how these aspects influence the intention to continue utilising e-resources. To collect data from a sample of university students and faculty members, quantitative research approaches such as surveys and usage behaviour analysis will be used. The findings will help to improve our understanding of the relationship between IoT affordances and e-resource retention intentions, giving significant insights for educational institutions as they develop their electronic resource strategy.

**Keywords**: *Internet of Things (IoT) affordances, Continuous usage intention, E-resources, University students and lecturers, Information technology, continuous usage.*

## Sub Theme 5

## Public Health and Clean Environment

# Heavy Metal Pollution Of The Birim River And Spatial Implication On Catchment Communities

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**Abstract**

The paper examines the heavy metal pollution of the Birim River and its spatial implications on the catchment area due to activities of illegal small-scale miners popularly called *Galamsey* in Ghana. A total of ten water samples were collected from five different locations along the river course for laboratory analysis at the Water Research Institute of the Council for Scientific and Industrial Research for 2017 and 2023. Heavy metals including Fe, Mn, Zn, Pb, Cu, Cd, Hg, and As were assessed based on method for analysis of water and wastewater. Geospatial data were collected and analysed using GIS software to examine the extent of mining activities and potential contribution to heavy metal pollution of the river water quality. The results showed that all the heavy metals recorded values were within WHO's standard for drinking water except Fe (0.42 – 137 mg/l) and Hg (0.12-32.3ug/l) for 2017 and (0.72 – 1.72 mg/l) and (0.03-6.6ug/l) for 2023 respectively. The level of heavy metal pollution of the river has reduced between 2017 and 2023. The Geospatial analysis showed that a total of 31 communities located within 1-3km and 10 Districts would be affected by the mercury and iron pollution of the river. The population in these catchment communities would be vulnerable to the risk of water pollution which will affect their water uses. There is the need to safeguard the river to reduce risks of mercury pollution through adoption of mercury free and sustainable mining techniques.

**Key words**; Water Quality Assessment, Birim River, Galamsey, GIS, Physicochemical analysis, development

# Capacity Building Needs Of Water And Sanitation Professionals Of MMDAs In Improving Access To Water, Sanitation And Hygiene Services In The Great Kumasi Metropolitan Area.

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## Abstract

Human resource development with adequate capacity building to improve WASH capacities and skills of related personnel has been an area where scholars of WASH have overlooked. Improvement in access to water, sanitation and hygiene in developing countries will be a mirage unless international partners and government give attention to enhancing the skills of WATSAN service providers through capacity building. The study attempts to answer the queston "What specific capacity building programmes enhance the skills of service providers and thereby improve access to WASH services". Using the mixed method approach, data was collected from 726 respondents through the use of semi-structured questionnaires and interview guides Ashanti Regional and Greater Kumasi Metropolitan Area. The study found that capacity building in the area of conflict management, emotional intelligence, circular economy among others will strengthen the capacity of WASH service providers to enhance their professional competences, provide some strategic directions to district assemblies and work towards the achievement of the Sustainable Development Goals (SDGs).

**Keywords*:*** Capacity Building, WASH, Professional competencies, Service provider, Sustainable Development Goals

# Environmental Challenges Resulting From Indiscriminate Solid Waste Disposal In Akure Metropolis, Ondo State, Nigeria

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Adekunle Ajasin University, Akungba-Akoko, Nigeria.

## Abstract

The economic implication of poor and inappropriate waste disposal on man and his immediate environment has become an issue of serious concern at local, national and international levels. Hence, this study examines the environmental challenges resulting from indiscriminate solid waste disposal in Akure Metropolis, Ondo State, Nigeria. The population for the study comprises residents of Akure South Local Government Area with a sample size of two hundred (200) respondents randomly selected from different sections of the study area. Data collection was done through the administration of self- constructed questionnaire while the data collected were analyzed through descriptive statistics. Findings revealed that environmental waste are generated from residential homes, places of worship, commercial centers among others, some of the environmental wastes are solids such as metals, polythene materials, paper, wood and agricultural waste which cannot easily decompose, very few percentage of residents of study area dispose their waste properly using government approved waste bins, there is shortage of both environmental waste disposal facilities and personnel managing the services, as well as lack of commitment by some of the personnel. Based on the findings of the study, insufficient waste disposal facilities, poor usage of the available waste disposal facilities by residence, lack of effectiveness of the waste disposal personnel were some of the factors responsible for challenges of environmental waste disposal in the study area. Therefore effort towards public enlightenment on dangers of inappropriate environmental waste disposal must be improved, full enforcement of environmental waste laws and its penalty need to be invoked.

**Keywords:** Environmental waste, epidemics, environmental laws, waste disposal.

# Geochemistry Of The Winneba-Mankwadze Pegmatites, Southern Ghana: A Clue To The Petrogenesis Of The Pegmatites.

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**Abstract**

The purpose of the study is to use geochemical data to determine the petrogenesis and mineralogical potential of the Winneba-Mankwadze pegmatites. The Eburnean Tectono-thermal Event occurred around 2195 Ma and had an impact on the Birimian Supergroup (2195-2135 Ma) of Ghana. At the most recent stage of this event, which occurred at 2072 Ma, Ghana's Birimian Supergroup developed pegmatitic veining. The geochemical properties of the pegmatites in the Winneba-Mankwadze were determined through field observations, petrographic studies and whole-rock geochemistry. The pegmatites can be categorized as being of the rare-element type based on the field observations and the petrographic data. Spodumene (0.0-30.0%), muscovite (0.0-20.0%), garnet (0.0-5.0%), microcline (0.0-20.0%), plagioclase (6.0-70.0%), and quartz (20.0-85.0%) are the modal compositions of the major minerals. The pegmatites are abundant in Rb (2.8-3465 ppm), Cr (22-1803 ppm), Sr (1.2-314 ppm), Ba (13-501 ppm), and the light rare-earth elements (LREE), according to the geochemical data. They are also poor in Ti and K. The pegmatites are of late-orogenic to post-orogenic and peraluminous with a calc-alkaline trend. As a result, the upper to middle crust supra-crustal rocks are the source lithology and the Birimian sedimentary-volcano-sedimentary rocks are the source of the pegmatites.

**Keywords:** Birimian Supergroup, rare earth elements, pegmatites, spodumene, garnet, microline.

## X-Ray Crystallography: An Important Tool For Sustainable Development

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**Abstract**

Since the discovery of X-rays by Rontgen in the latter part of the $19^{th}$ century there have been great advancements in scientific and technological research involving the use of this high energy radiation. Notably, X-rays are used in medical diagnosis to probe internal structures such as skeleton and alimentary canal for defects and other conditions that may need medical attention. X-rays are also used in sterilization and cancer chemotherapy. The science of crystallography involves the use of x-ray radiation determine the structure of materials. These materials can be powdery or crystalline. X-ray crystallography has been used to study the composition of materials such as mineral deposits, salts, pharmaceuticals, agrochemicals, plastics, metals and alloys, rock samples and various types of clays. This presentation will focus on x-ray crystallography for the determination of the structures of materials such as clay minerals, metal-organic-frameworks (MOFs) and crystals which have been synthesized in our laboratory. It will also demonstrate the use of the Cambridge Structural Database (CSD), a repository of organic and metal organic structures for research and teaching concepts in structural chemistry and crystallography. It will also introduce participants to research and collaboration opportunities available at the XTECHLAB (A regional laboratory supported by the Light sources for the Americas, Asia, Africa Middle East and the Pacific (LAAAMP), the International Union of Crystallography (IUCr) and the Benin Government) which seeks to train the next generation of scientists and engineers in the field of applied crystallography.

## Extended Norm Activation Model And Households' Sustainable Water Footprint Behaviour: A Moderated Mediation Model

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**Abstract**

Freshwater plays a crucial role in fundamental production systems. The allocation of freshwater resources is primarily dominated by the agricultural and industrial sectors, which account for approximately 70% and 22% of global usage, respectively. In light of the impending global water scarcity, it becomes imperative to undertake significant alterations in the governance and utilization of water reservoirs, with the aim of mitigating food security concerns. As a result, Ghana's water sector has undergone substantial expansion throughout the years, ultimately leading to the implementation of the National Water Policy in 2007. This paper aims to extend Schwartz's (1977) norm activation model (NAM) with situational responsibility (SR) and environmental concern (EC) to explain sustainable water footprint behaviour of households in the Greater Krobo Municipalities towards the realization of Sustainable Development Goal Six (SDG6), thus, ensure availability and Sustainable management of water resources in peri-urban communities in Ghana. The study is anchored on positivist's epistemology and quantitative research approach. Survey based instrument has been used to elicit data from 445 households. The hypotheses of the study have been tested using variance based structural equation model. The study has revealed that the dimensions of NAM (e.g., personal norm, ascription of responsibility and awareness of consequences) have significant and positive effects on sustainable water footprint behaviour. Moreover, environmental concern significantly mediates the relationship between the dimensions of NAM and sustainable water footprint behaviour. In conclusion, the study has implications on the development of pro-environmental enabled model to explain sustainable water footprint behaviour in the context of low resource setting where such studies have largely remained fuzzy. The practical and policy implications have been discussed in herein.

**Keywords:** Norm Activation Model, Environmental Concern, Sustainable Water Footprint Behaviour

**Environmental Education And Justice: Religion's Corporate Social Responsibility For The Reversal Of Judeo-Christian Theory**

Kwame Benyibaling Bour

ABSTRACT:

The world has since the 1970s been experiencing unprecedented increase in urban decay, pollution, overpopulation, resources shortage, ozone layer depletion and general environmental degradation culminating in human reconceptualisation of the environment. These environmental sustainability challenges have reached a tempestuous stage that requires an all-hands-on-deck approach to fix. This calls for environmental education and justice at community levels to create awareness among inhabitants who break environmental good practices naively. So, there is the dire need for environmental education and justice. However, Judeo-Christian theory has laid the blame on the door steps of Abrahamic religions. So Judeo- Christians (including Muslims) stand accused of environmental violations and that should form part of the reversal process and resolution. This study therefore, aims to find out the applicability of Judeo-Christian Theory among the contemporary Judeo-Christian organisations in Ghana and to design strategies for environmental education to achieve environmental justice for all. It is a qualitative study with a phenological design to study lived experience of Judeo-Christians. Abrahamic religious leaders were involved. Focus Group Discussions and Interviews were the main tools used to collect data, which was analysed manually. It revealed that Judeo-Christian theory is relevant in Ghana. The outcome of this study is recommended for policy makers, religious bodies and other stakeholders as reference material for enhancing the achievement of SDGs 11, 12, 13, 14 and 15 in Ghana and beyond.

# Health Care Waste Management In Ghana: The Role Of The Private Sector

***Michael Affordofe[1*], Richard Amfo-Otu[2]; Enoch Akyeampong[1], Senam Tengey[3]***

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## Abstract

**Background:** Healthcare waste management attracted global attention prior to the outbreak of Ebola in some parts of Africa and the COVID-19 pandemic. The study looked at the role of the private sector in managing healthcare waste in Ghana. **Methods:** A mixed-method approach was adopted to collect data from private companies and key stakeholder informants. Secondary data was collected from a waste treatment company for analysis. **Results:** It emerged that private companies in Ghana have been involved in collecting healthcare waste for treatment and disposal. Most of the private waste management companies have not been licensed to transport infectious waste to disposal sites except ZoomPak Ghana Limited. All the companies were engaged in the collection, transportation and disposal of infectious waste without proper treatment, except ZoomPak which operated a treatment plant for profit. A total of 12.4 - 122.8 tons of infectious waste were treated in 2016 and 2019 respectively, before COVID-19, from predominantly private health facilities with only two government-owned health facilities covered by their operations. **Conclusion:** The increase in treatment quantities was linked to the UNDP Medical Waste Project, the passage of the Hazardous Waste Bill, stakeholder engagements and rigorous marketing. Collection, transportation and treatment of healthcare waste were the roles of the private sector prior to the COVID-19 pandemic. Post-COVID-19 demand partnerships should focus on proper segregation, transportation and treatment of healthcare waste to prevent the spread of the virus or emergency of different strains from the waste.

**Keywords:** Health Care Waste, Waste Collection, Waste Treatment, Private Companies, COVID-19

## Household Air Pollution And Hypertension In Abokobi In The Ga East Municipal Assembly

*Courage Daneku 1* , Michael Affordofe 1 , Enoch Akyeampong 1*

1 Department of Environmental Health and Occupational Health and Safety, Accra School of Hygiene, Ghana

**Abstract**

**Background:** Air pollution from indoor and outdoor sources are the single leading contributor to adverse health outcomes such as cardiovascular and respiratory morbidities and mortalities. Indoor air pollution is associated with estimated 15,000 deaths yearly in Ghana. To assess personal exposure to indoor and outdoor air quality and symptoms of hypertension among people living in Abokobi**.** This was a population-based cross-sectional study involving 200 randomly selected households. The data was collected on the following; socio-demographic characteristics, any exposure to indoor and outdoor air pollutants and symptoms related to hypertension. A questionnaire loaded in a Research Electronic Data Capture (REDCap) application was employed to collect the data. The data was analyzed into tables and charts and the association between determinants of interest and outcome of interest was analyzed with a relative risk ratio and odds ratio with a confidence interval of 95%. The proportion of adults reporting hypertensive symptoms was 21.00%. The commonest waste management strategy adopted for waste such as paper (71.06%); plastic (69.04%) and wood (70.33%) is burning. The mean concentration of PM 10 was higher in outdoor settings compared to indoors (89.89 ± 7.90 vs 79.31 ± 14.37). Also, PM 2.5 was higher in outdoor settings compared to indoor (69.16 ± 9.45 vs 56.61 ± 9.56). There was a significant association between exposure to personal particulate matter (PPM 2.5) and systolic blood pressure (Adjusted β 2.12, 95%CI 1.59-7.89). There were 3.06 times more likely to suffer hypertension after being exposed to PPM 2.5 (Adjusted OR 3.06, 95%CI 1.12-7.23). Though the prevalence of hypertensive symptoms from exposure to indoor and outdoor air pollution was low, regular check-ups to know BP status for early treatment are recommended.

**Keywords:** Air Pollution, Particulate Matter, Informal Settlement, Hypertension, Abokobi

## Psychological Distress And Coping Among Nurses During Covid-19 Pandemic In Ghana

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*Isaac Nyarko Kwakye (PhD), Department of Built Environment, University of Environment and Sustainable Development.*

**Abstract**

The research focused on examining the psychological distress nurses experienced amidst COVID-19 pandemic and coping strategies employed to manage this distress. A survey design was employed and 50 nurses were selected using census approach. Data collection involved utilizing Hospital Anxiety and Depression Scale (HADS) and Afrocentric Coping System Inventory (ACSI). Data was analyzed using IBM SPSS version 24. Findings revealed that nurses encountered high levels of psychological distress, as indicated by the mean scores for anxiety (mean = 12.216) and depression (mean = 11.266). However, coping mechanisms adopted by the nurses were found to be low. Anxiety had significant impact on depression, whereas coping mechanisms did not exert a significant influence on depression. Additionally, the overall coping mechanism showed no significant association with psychological distress at a significance level of 0.05. Cognitive and ritual coping mechanisms were found to have no significant effect on psychological distress, whereas spiritual and collective coping mechanisms demonstrated significant impact on psychological distress. The negative coefficients indicated that an increase in spiritual coping ($\beta$ = -2.6817) or collective coping methods ($\beta$ = -0.8110) could effectively reduce psychological distress in nurses. Notably, collective coping mechanisms exhibited a stronger negative effect on psychological distress compared to spiritual coping methods. It is recommended that counseling and psychotherapeutic services be made available to nurses to support them in fulfilling their duties during the pandemic. Furthermore, it is advised to encourage the adoption of appropriate coping strategies, particularly collective and spiritual coping, to help nurses effectively manage their distress.

**Keywords:** Covid-19, Distress, Psychological, Coping, Nurses

# Occupational Health And Safety Knowledge, Attitude And Practices Of Students In A Selected Senior High School In Kumasi, Ghana

***Susanna Mwinkum Tantuoyir***

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## Abstract

This study aims to assess the level of knowledge, attitude and practices of Occupational Health and Safety among students at St. Louis Senior High School, Kumasi, Ghana. A cross-sectional descriptive study was conducted among 150 respondents, of which the mean age was 17.11 and standard deviation was 0.928. The findings from analysis using SPSS revealed that 68% of the respondents had some level of knowledge and perception about occupational health and safety but had low concern (54.7%) towards health and safety. Only about half of the respondents (50.7%) had some interest in the health and safety measures in the school. A descriptive analysis was conducted to assess the level of awareness of the students by computing mean Hazard Awareness Indices for the school. Findings revealed that the students were aware of environmental hazards in the school with high awareness on the bed bugs in the dormitories (0.26) and the stress from the poor conditions of their beds and mattresses (0.10) with standard deviation of 0.16. The conclusion was concluded and recommended that efforts should be made by school management and government on creating safe learning environs and training to improve occupational health and safety practices in school.

**Keywords:** hazard awareness, occupational health, knowledge, attitude, and practices

**Conference Programme Outline**

**UNIVERSITY OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**
**3RDSUSTAINABLE DEVELOPMENT CONFERENCE**
**6th – 9th September, 2023**

**Conference Programme: Integration of Responsible Production and Consumption into Development Agenda of Developing Economies: Exploring Policies, and Scientific Options**

| Time (GMT) | Activities |
|---|---|
| | **Day One: Wednesday, 6th September 2023**<br>**Arrival of participants** |
| | **Day One: Thursday, 7thSeptember 2023.** |
| **8:00 – 9:00** | **Arrival and Registration** |
| **9.00 – 9.30** | **Welcome and Opening Remarks**<br>• **Opening Prayer-** Dr. Michael Tuffour<br><br>**Introduction of Chairman for the Conference -** MC<br>• Prof. Jonathan Narh Ayertey - Council Chairman – University of Environment and Sustainable Development<br><br>• **Chairman's Acceptance Remarks**<br><br>**Welcome and Opening Remarks**<br><br>• Prof. Eric Nyarko-Sampson<br>Vice-Chancellor - University of Environment and Sustainable Development (UESD)<br><br>**Special Guest**<br>Dr. Richard Osei Bofah<br>Chief Analyst, Development Policy and Planning Division, NDPC<br>***Integration of Responsible Production and Consumption into Development Agenda of Ghana*** |
| **9.30 – 10.30** | **Keynote Speakers**<br>• Mr. Prosper Ahmed Amuquandoh (Renewable Energy and Policy Expert) |

| | |
|---|---|
| | ***Integration of Responsible Production and Consumption into Development Agenda of Developing Economies: Exploring Policies, and Scientific Options.***<br><br>• Discussion of Keynote Speaker's Address<br>Prof. Amoah/Dr. Rexford Asiamah |
| **10.30 – 11.00** | **Group photograph and snack** |
| **11.00 – 13.00** | **Panel Discussion**<br>Promoting Responsible Production and Consumption in Ghana, Policy options to Consider<br>• FAO Representative<br>• EPA – Ms. Leticia Nyaaba<br>• Accra Plastic Manufacturers Association– Mr. Ebo Botwe<br>• Energy Expert – Dr. Paapa Benin<br><br>**Moderator:** Dr. Nuworza Kugbey/ Kwame Adjei Mantey<br>University of Environment and Sustainable Development |
| **13.00 – 14.00** | **Lunch** |
| **14.00 – 16.30** | **Technical Session**<br>**Introduction of Chairpersons for Technical Presentation Sessions**<br>Dr. Kwame Bour<br>• Circular economy and healthy food systems;<br>• Clean, affordable and sustainable energy;<br>• Public Health and clean environment;<br>• Biodiversity and ecosystem restoration;<br>• Consumption behaviour and socio-economic development; and<br>• Gender, production and consumption |
| **16.35 – 16.50** | **Wrap- Up & End of Day 1**<br><br>• Dr. Mathias Neina<br><br>• Announcement – MC<br><br>• Closing Prayer – Dr. Isaac Abekah Koomson |
| **16:55- 17:55** | **Closing for Day 3** |
| | **Day Two: Friday, 8th September, 2023.** |

| | |
|---|---|
| 9.00 – 9.15 | **Opening Prayer and Recap of Day 2**<br>Dr. Sam-Quarcoo Dotse<br>University of Environment and Sustainable Development |
| 9.20 – 12:00 | **Panel Discussion**<br>Promoting Sustainable Resource Extraction and Consumption: The Case of Surface Mining in Ghana<br>• Small Scale Mining Association of Ghana– Mr. Emmanuel Y. Antwi<br>• EPA Representative<br>• A Rocha Ghana – Mr. Daryl Bosu<br>• UESD - Dr. Abass Gibrilla<br>• SDS -UCC – Dr. Emmanuel Tenkorang<br>• Friends of the Nation – Mr. Solomon Kusi Ampofo<br>• Centre for Environmental Impact Analysis, Cape Coast - Mr. Samuel Obiri<br><br>**Moderators**:<br>Dr. Felicia Annin<br>University of Environment and Sustainable Development |
| 12:00 – 13:00 | **Lunch** |
| 13:15 – 15:00 | **Technical Session**<br>**Introduction of Chairpersons for Technical Presentation Sessions**<br>Dr. Rahmat Quaigraine Duker<br>University of Environment and Sustainable Development<br><br>Circular Economy and Healthy Food Systems:<br>• Clean, affordable and sustainable energy;<br>• Public Health and clean environment;<br>• Biodiversity and ecosystem restoration;<br>• Consumption behaviour and socio-economic development; and<br>• Gender, production and consumption<br>• |
| 15:05 – 15:30 | **Certification and Announcements – Dr. Louis Frempong** |
| 15:45 – 15:55 | Chairman's Closing Remarks |
| **15:55 – 16:00** | Vote of Thanks |
| | **Day 3: Saturday, 9th September, 2023** |

| | |
|---|---|
| **6:00 – 15:00** | Departure for Fun Trip to Amedzofe Canopy Walk |

**Departure**

| | |
|---|---|
| ***MCs:*** | ***Dr. Stella Eunice Nyarko/Ms. Joyce Amfo*** |
| | ***University of Environment and Sustainable Development*** |
| ***IT Team:*** | ***Mr. Eric Asiedu and DITSO Team*** |

# SUSTAINABLE DEVELOPMENT INTERNATIONAL CONFERENCE PROGRAMME (2023 EDITION)

| 7th September, 2023 | Day One: Presentation of Papers | | | | |
|---|---|---|---|---|---|
| **Time (GMT)** | | **Activity** | | | |
| **14:00 – 14:10** | | **Introduction of Chairpersons for Technical Presentation Sessions** | | | |
| | Breakout Sessions for Scientific Paper Presentation | | | | |
| **Time (hr)**<br>**14:10 – 16:40 pm** | **Lecture Room 6B**<br>**Clean, Affordable and Sustainable Energy** | **Lecture Room 6A**<br>**Biodiversity and Ecosystem Restoration** | **Video Conferencing Room**<br>**Production, Consumption Behaviour, Gender and Socio-economic Development** | **Computer Lab**<br>**Circular Economy and Healthy Food Systems** | **Multipurpose**<br>**Public Health and Clean Environment** |
| **Day Two, Afternoon Session** | | | | | |
| **Chairpersons** | **Dr. Sam-Quarcoo Dotse** | **Prof. Nii Moi Pappoe** | **Dr. Shine Francis Gbedemah** | **Prof Anthony Amoah** | **Prof. Kofi Nyarko Mensah** |
| **14:10 – 14:30** | The Perspectives and Realities of Energy Use Among Urban Poor in Accra and Tamale in Ghana: Towards Clean Energy Infrastructure Development. (***Fatima Eshun***) | Bird Raiding on Rice Fields in Ghana: Evaluating Bird Species and Economic Losses. (***Prof. Edward Debrah Wiafe***) | Assessing the Determinant Characteristics for Selection of Cement for Manufacturing of Sandcrete Blocks (***Robert Kwame Senu***) | Greening the Academic Library: analysis of the effectiveness of sustainable online services towards reducing the environmental impact of academic libraries (***George Clifford Yamson)*** | Environmental Education and Justice as Corporate Responsibility of Religious Organisations in Ghana: An Islamic- Judeo-Christian Reversal Model (***Kwame Benyibaling Bour***) |
| **14:31 – 14:50** | Planning For Walkable Cities in Africa: Co-Producing Knowledge on Conditions, Practices, And Strategies (***Louis Kusi Frimpong, Seth Asare Okyere, Stephen Leonard Mensah & Daniel Oviedo***) | Occurrence and ecological risk study of some antibiotic residues in the Sunyani municipality, Ghana (***Miss Bernice Araba Otoo***) | Taxation And Sustainable Development in Developing Economy: A Research Synthesis for Resilient and Adaptive Economy (***Lateef A. Agbetunde, Lateef B. Adedokun & Musa Olatunji Dawodu***) | E-Library and E-Laboratory Experiences of Undergraduates for Learning on Ondo State University (***Akingbemisilu, Abiola Afolabi & Adodo, Sunday Olufemi)*** | Health Care Waste Management in Ghana: The Role of The Private Sector (***Michael Affordofe, Richard Amfo-Otu; Enoch Akyeampong, Senam Tengey***) |
| **14:51 – 15:10** | The Nuclear Drive Towards Sustainable Development in | | | Assessing Risks of Households Food insecurity | Heavy Metal Pollution of the Birim River and Spatial |

| | | | | | |
|---|---|---|---|---|---|
| | Ghana (***Abdallah M. A. Dawood, & Oscar K. Adukpo***) | PAH-Contaminated Sediment Remediation with activated Charcoal (***Rahmat Quaigrane Duker, & Jedidiah Koomson)*** | Stochastic Analysis of Public Debt Stock and Debt Sustainability in Ghana (***Eunice Stella Nyarko***). | and Foreign Remittances: Evidence from a National Survey, Ghana (***Dominic Buer Boyetey, Christian Akrong Hesse, Theodora Akweley Asiamah, Khinanwin Nyande)*** | implication on Catchment Communities (***Richard Amfo-Otu, Albert Nii Moi Allotey, Daniel Foster, Emmanuel Adu-Ofori***) |
| **15:11 – 15:30** | Integration of Nuclear and Renewables in Sustainable Energy Systems: A Pathway to Achieving SDG 12 (***Mark Amoah Nyasapoh, Samuel Gyamfi, Seth Kofi Debrah, Hossam Gaber & Nana Sarfo Agyemang Derkyi***) | Climate-Smart Cocoa Technologies in Cocoa Farming: A Multidimensional Environmental Well-Being Analysis. (***Kwaku Adu)*** | Access versus Productivity: Marketing Mangoes in the Yilo Krobo Municipality, Ghana (***Angela Kyerewaa Ayisi-Addo, Dominic Buer Boyetey, Prize F.Y. McApreko***) | Influence of Biochar Substrate on A Sustainable Yield and Quality of Tomato in A Solar Greenhouse. (***Samuel Joe Acquah, Haofang Yan, & Chuan Zhang)*** | Household Air Pollution and Hypertension in Abokobi in The Ga East Municipal Assembly ***(Courage Daneku, Michael Affordofe, Enoch Akyeampong)*** |
| **15:31 – 15:50** | Potential Utilization of Wood Waste as Sustainable Renewable Energy Resource in Ghana (***Daniel Sarpong)*** | Petrographic And Structural Analysis of Paleoproterozoic Birimian Granitoids and Associated Rocks of Boankra Areas in the Kumasi Basin of Ghana (***Kingsley K. Tandoh, Shine F. Gbedemah, Maximillian-Robert S. Doku, Salaam J. Adams, Blestmond A. Brako***) | Women Participation in Drumming in The Northern Region of Ghana (***Sophia Mayona, Godfred Teye Mensah Akuffo, Jessica Amoah, Wisdom Tailor, And Nentwi Kamkam)*** | Analyzing A Novel Organic Substrate and Fertilizer Formulation for Sustainable Crop Production (***Fatima Eshun, Samuel Joe Acquah, Shine Francis Gbedemah, Richard Amfu-Otu, Micheal Tuffour, Anthony Amoah)*** | Psychological Distress and Coping Among Nurses During Covid-19 Pandemic in Ghana (***Cynthia Essel, & Isaac Nyarko Kwakye***) |
| **15:51 – 16:10** | Beyond Security and Reliability of Electricity Towards Sustainable Electricity Systems (***Joyce Angnayeli Eledi Kuusaana)*** | An African Ecocritical Consciousness: A Reading of Amma Darko's Faceless (**Felicia Annin**) | | An Assessment of the Sustainability of Eco-Pavement and Concrete Pavement Bricks: A Comparative Study (**Andoh Ernestina, Lloyd Larbi, & Vera Sarfo Danso**) | Capacity Building Needs of Water and Sanitation Professionals of MMDAS In Improving Access to Water, Sanitation and Hygiene Services in the Great Kumasi Metropolitan Area (***Emelia Amoako Asiedu, & Richard Amfo-Otu***) |

| Day Two (8th September) | Day Two (8th September) | Day Two (8th September) | Day Two (8th September) | Day Two (8th September) | Day Two (8th September) |
|---|---|---|---|---|---|
| **13:20 – 13:40** | Beyond security and reliability of electricity towards sustainable electricity systems (***Joyce Angnayeli Eledi Kuusaana***) | Harnessing Genomics as A Tool for Biodiversity Conservation (***Seun Elijah Olufemi, Daniel Adewole Adediran, & Elijah Kolawole Oladipo***) | Role of Non-Governmental Organizations in Promoting Sustainable Lifestyles in Water Production and Consumption (**Sylvia Baidoo, Michael Karikari Appiah, & Joyce Amfo**) | An Assessment of Metal Scrap and Its Environmental Impact in Kano-Nigeria (***Basheer Garba Fagge, Tosin Owolabi Sunday & Adamu Yusuf Sawaba***) | Occupational Health and Safety Knowledge, Attitude and Practices of Students in a Selected Senior High School in Kumasi, Ghana (***Susanna Mwinkum, Tantuoyir***) |
| **13:41 – 14:00** | Effectiveness of a Power Factor Correction Policy in Improving the Energy Efficiency of Large-Scale Electricity Users in Ghana (***Samuel Lotsu***) | Getting ahead of the threat' ***(Daryl Bosu)*** | Impact of Natural Fibres on The Properties of Fibre-Reinforced Cementitious Composites (**Braimah Kassum**) | | Environmental Health Implication of Solid Waste Disposal in Urban Centres, Akure as a Case Study (***Aladejebi David Toyin***) |
| **14:01 – 14:20** | Effects of Fuel Subsidy Removal on Consumption Behaviour and Socio-Economic Wellbeing of Salary Earners in Nigeria (***Kehinde Olufemi Ogunyemi, & Samuel Olanrewaju Oladapo***) | Petrographical Studies on The Basin Type Granitoids of Agyaemmakrom Areas in the Kumasi Basin of Ghana (***Kingsley K. Tandoh*, Adimah Anastasia Akofa[1] 1blestmond A. Brako)*** | Internet of Things: Affordance in the Continued Usage Intention of E-Resources Via Household Internet Access Among University Students and Faculty (**Mrs. Mary Agyapong, & Mr. George Clifford Yamson**) | | Geochemistry of the Winneba-Mankwadze pegmatites, southern Ghana: A clue to the petrogenesis of the pegmatites. ***(Salaam Jansbaka Adams et al.)*** |
| **14:21 – 14:40** | Achieving financial sustainability of the power sector in Ghana: Recent trends and the role of sector players. (***Amo Duodua, Nakotey Korleyb & Emmanuel Kusi Addoc***) | Characterization and RP-HPLC Method Development of a Biomarker (Bergenin) From the Roots of Securinega Virosa. (***Amenu J. D., Ayensu, I., Bekoe S. O., & Yamoah A.***) | Evaluating Workplace Performance of Graduates from Vocational and Technical Education Programs in Ondo State, Nigeria. (***Bamidele O. Olumoko Ph.D & Hope Gbenga-Arotiba***) | | X-Ray Crystallography: An Important Tool for Sustainable Development (***Samuel Tetteh***) |

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| **14:41 – 15:00** | Assessing the Triple Bottom Line Implications of Biomass Boilers in the Ghanaian Textile Firms: 'A Sustainability Perspective' (***Christiana Konamah Okai-Mensah & Kwasi Okai-Mensah***) | Impact of Security Education on Environment and Natural Resources for the Benefits of Present and Future Generations (***Olowo Oluwatoyin Olusegun Ph.D.***) | | | |
| **15:01 – 15:20** | Achieving financial sustainability of the power sector in Ghana: Recent trends and the role of sector players. (***Amo Duodua, Nakotey Korleyb & Emmanuel Kusi Addoc***) | The Efficiency of Satellite Automatic Identification System (Sat-Ais) Device for Monitoring Small Scale Fisheries in Ghana ***(Daniel Agyei)*** | | | |

| **Student Session (Chair - Dr. Daniella Delali Sedegah & Dr. Kodwo Dadzie Ninsin & Felicia Annin) LT 3A** | | | | | |
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| 14:10 – 14:25 | Extended Theory of Planned Behaviour to Predict Smart Meter Adoption and Energy Saving Behaviour in the Yilo Krobo Municipality (***Michael Karikari Appiah, Portia Teye Korlekie***) | UV-Spectroscopic Fingerprint as A Rapid Quality Control Tool for Alcoholic Herbal Drinks Sold at Pubs and Clubs in Somanya (***Mohammed Saani, Jones Buabeng, Veronica Aduko, James Buabeng, Justice Amenu, and Jonathan Osei-Owusu***) | Industry 4.0 Capabilities and Sustainability of African Continental Free Trade Agreement: The Role of Digitalization Orientation and Organizational Ambidexterity (***Michael Karikari Appiah & Isabella Owusu-Ansah)*** | Smart Manufacturing and Sustainable Production in the Ghanaian Manufacturing Industry: A Moderated Sequential Mediation Model (***Michael Karikari Appiah, Elikplim Ameko)*** | Creating A Healthy and Clean Environment: Strategies for Sustainable Development (***Abdul Rafiq Sachibu &Amp; Angela Kyerewaa Ayisi-Addo***) |
| 14:26 – 14:40 | Knowledge Acquisition on Africa through African and Gender Studies Curriculum: Black/African Tertiary Students' Perceptions and Outcomes in a Developing Context (Ghana)". (***Tracy Keith Flemming, Jilly Philippa Joel Premkumar,*** | UV-Spectroscopic Fingerprint as A Rapid Tool for the Quality Control Analysis of Herbal Medicines Sold in Somanya ***(Roseline A. Sunkwa-Arthur, Claudia P. Asare, Edem A. Quarshie, Winfred D. Dzikunu,*** | Social Commerce and Small Business Sustainability: An Extended Toe Model with Social Capital Theory (***Michael Karikari Appiah & Princess Micah)*** | Effective Production and Consumption of Food in Ghana: Preserving Shelf Life of Produce at Farmgate Using Post Harvest Cool Rooms (***Bernard Ayensu***) | Extended Norm Activation Model and Households' Sustainable Water Footprint Behaviour: A Moderated Mediation Model (***Michael Karikari Appiah, Richard Kwasi Padi***). |

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| 14:46 – 15:00<br><br>15:01 – 15:15 | ***Godfred Teye Mensah Akuffo, Rosemary Anderson Akolaa, Aziz Adamu, Henrietta Abla Johnson, and Jennifer Teiko Larbi*** | ***Blessing N.A. Yeboah, & Jonathan Osei-Owusu)*** | Comprehensive Action Determination Model and Low Carbon Consumption Behaviour: A Chain Intermediary Effect Analysis (***Michael Karikari Appiah & Felix Kwetey Akporsuer)***<br><br>Assessing The Long-Term Impact and Sustainability of The Alternative Livelihood Program for Street Hawkers in Kpong under the Magg Project ***(Nana Akosua Korang Agyare, Joseph Odei Foli, Nicholas Junior Nuamah, & Angela Kyerewaa Ayisi-Addo***). | Effective Production and Consumption of Food in Ghana: Preserving Shelf Life of Produce at Farmgate Using Post Harvest Cool Rooms (***Bernard Ayensu***). | Water Quality Assessment of some Selected Sachet Water Sold in Somanya and Water Supply System on UESD Campus: A Comparative Analysis (***Benjamin Ataa Frimpong, Benjamin D. Amevor, Nechamah N.O. Aryee, Sherriff Azando, Stephanie Opoku & Jonathan Osei-Owusu***) |
| **DAY 3**<br>15:30 -15:45 | **Closing**<br>Closing Remarks from VC, UESD<br>Announcement – Cynthia Oduro Ameyaa | | | | |