**Day 1 – October 27th**

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| Time | Session Description |
| 9-9:45 | Opening session **Onita Basu**, Carleton UniversityGuest Speaker: **Wales Singini**, Mzuzu University |
| **Session 1: Water and Public Health** |
| 9:45-10:05 | **Robbie Venis**, Carleton University, “Towards Universal Safe Water Access in Rural Tanzania: Moving from Provision to Service Models” |
| 10:05-10:25 | **Jasser Martinez-Garcia**, University of Cartegena, “Effects of Climate Change on the Mobility of Organophosphates Pesticides in Soils of the Arroyo Grande Coastal Aquifer, Bolivar, Colombia” |
| **Session 2: Speed Round** |
| 10:25-11:00 | **Speed Round** **Sandra Obiri-Yeboah**, University of Ghana, “Impact of climate change on farm yields and migration in some selected communities in Northern Ghana”**Douglas Singini**, University of Waterloo, “Challenges to livelihood practices on the Barotse flood plain following climate change-related shocks”**Tsilavo Raharimahefa**, University of Regina, “Impacts and assessment of climate change in the Isalo National Parks, Southern Madagascar”**Michael Sepula**, Mzuzu University, “Mitigation of Environmental Impacts of Hospitality Operations & Tourist Recreational Activities on Lake Malawi in Malawi” |
| **Session 3: Business and Agriculture** |
| 11:00-11:20 | **Theodora Aryee**, University of Ghana, “The Accountant and the Climate Action Goal” |
| 11:20-11:40 | **Mabel Enyonam**, University of Ghana, “Drivers of Change and Roles: Smallholder Farmers’ Perspectives on Resource Needs for Climate Change Adaptation” |
| 11:40-12:30 | Guest Speaker: **James Meadowcroft**, Carleton University, “Accelerating the Transition to Net Zero”Closing |

**Day 2 – October 28th**

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| Time | Session Description |
| 9-9:45 | Opening session: **Onita Basu & Karen Schwartz**, Carleton UniversityGuest Speaker: **Mwemezi Rwiza**, Nelson Mandela African Institute of Science and Technology |
| **Session 1: Urban Infrastructure and Food Security**  |
| 9:45-10:05 | **Yaw Boafo**, University of Ghana, “Exploring the Impacts of Urban Expansion on Green Spaces Availability and Delivery of Ecosystem Services in the Accra Metropolis” |
| 10:05-10:25 | **Enock Dankyi**, University of Ghana, “Pesticide use, climate change and pollinator health: Assessing impacts on cocoa yields in Ghana”  |
| **Session 2: Speed Round** |
| 10:25-11:00 | **Speed Round****Alexander Nii Adjei**, University of Ghana, “Navigating Inheritance Rules: Land Access and Climate Change Adaptation”**Rosaliah Mughogho**, Mzuzu University, “The Effects of Rainfall and Temperature on Malaria Transmission in the Northern Region of Malawi”**Eric Doe**, University of Ghana, “Advancing regenerative agricultural ecological intensification of cocoa cropping systems with soil microbial biomass and productivity”**Wondia Yeo**, University of Johannesburg, “Potential for a Sustainable and Inclusive Energy Transition in Côte d’Ivoire: a Gender Approach” |
| **Session 3: Food Security**  |
| 11:00-11:20 | **Brunhel Vambi**, Laval University, “Sustainable intensification of yam agroforestry systems as an adaptation strategy to climate change for the improvement of food security around the Luki Biosphere Reserve in the Mayombe and Ibi Village on the Bateke Plateau, in DR Congo” |
| 11:20-11:40 | **Ginny Lane**, University of Idaho, “Climate change pushing Guatemalan families into food insecurity” |
| 11:40-12:30 | Guest Speaker 4: **Luc Mougeot**, IDRCQE West Welcome: **Nduka Otiono**, Carleton UniversityClosing |

# abstracts – day 1 Session 1

**Towards Universal Safe Water Access in Rural Tanzania: Moving from Provision to Service Models**

**Robbie A. Venis1**, Virginia Taylor2,3, Paulina Sumayani3, Marie Laizer3, Onita. D. Basu1

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As the halfway point of the Sustainable Development Goal (SDG) period approaches, insufficient progress towards the realization of SDG 6.1, universal safe drinking water access, raises important questions regarding the present methodological paradigm (UN, 2021). And with current and impending climate change impacts threatening both the quality and quantity of available drinking waters (Bates, et al., 2008), this paucity risks translating to the exacerbation of present marginalities. For example, of the estimated 2 billion people without safe water, 83% live in rural areas (World Bank, 2018). Meanwhile, Martin et al. (2018) found that 65-95% of drinking water interventions in these geographies fail to realize their intended results within 6 months of implementation. Rural populations are thus those most disadvantaged, and consequently those most at risk of suffering from worsening climate change impacts. This research responsively investigates localized and participatory intervention planning and education methods, combined with regular interfacing between implementers and program participants, to better elucidate how health and life outcomes may be sustainably improved within such communities.

Three years of consultations in Longido, Tanzania occurred between 2016-2019, where a combination of key informant interviews, focus group discussions, and observational learning were used to develop a drinking water intervention among 50 Maasai women. A 14-week water, sanitation, and hygiene participatory education program was resultingly developed iteratively with local community programming specialists, where local Maasai educators interfaced with participants weekly. Ceramic water filters, point-of-use water treatment solutions for microbiological contamination, were also provided for use in homes. The education program was moreover repeated at Baseline, as well as 9 months and 15 months after intervention, as shown in Figure 1. Diarrheal health outcomes among the participants and their children were then recorded by the local educators at baseline, as well as 3, 6, 12, 15 and 18 months after intervention. The percentage of the group reporting monthly diarrheal frequency moreover fluctuated from 38% at baseline to 7% at 3 months (after education), then returning to 32% after 6 months when education had ceased. After education programming restarted 3 months thereafter (9 months), 0% of the group reported diarrhea at the 12-month reporting time, increasing to 10% at 15 months, and decreasing again to 2% at 18 months after the 3rd education session was completed. Additionally, less filters broke during this program than has been reported in literature (Brown, 2007; Roberts, 2004). The intervention therefore showed a positive correlation between education provision and health, illustrating how locally relevant education may facilitate water technology uptake, and further, that regular interfacing between implementers and participants is critical to addressing long-term water access. Exclusive technology provision is thus demonstrably inadequate, and interveners must transition to long-term service models if SDG 6.1 may be realized.

**Effects of Climate Change on the Mobility of Organophosphates Pesticides in Soils of the Arroyo Grande Coastal Aquifer, Bolivar, Colombia**

**Jasser Martínez-García1**, Beatriz E. Jaramillo-Colorado2, Clare Robinson3, Edgar Quiñones-Bolaños1, Mehrab Mehrvar 4

1Faculty of Engineering, University of Cartagena, Cartagena, Bolivar, Colombia

2Faculty of Science, University of Cartagena, Cartagena, Bolivar, Colombia

3Department of Chemical and Biochemical Engineering, Western University, London, ON, Canada

4Department of Chemical Engineering, Ryerson University, Toronto, ON, Canada

This funded QES research project is to model the effects of climate change on the transport of organophosphate pesticides in soils, the risk to the groundwater of the coastal aquifer of Arroyo Grande in the Northern part of the Colombian Caribbean in Colombia. This body of water is a source of fresh water used for agricultural activities and for the supply of drinking water, located at the north of the department of Bolívar and is an area of ​​great projection for the development of tourism in which there are no policies for the sustainable use of this valuable resource**1**. Four types of soils where organophosphate pesticides are used to combat crop pests are characterized for their hydro-geochemical parameters. The modeling is adjusted from tests of undisturbed soil columns where the concentration of the organophosphate pesticides Chlorpyrifos© and Parathion© are monitored after 7, 14, 30, and 60 days. The extraction of pesticides from the soil samples is carried out by ultrasound assisted and quantified by Gas Chromatography coupled with Mass Chromatography**2**. Then, the transport of pesticides in the soil columns is modeled with the MACRO 5.2, where this software has shown good results to model and simulate the transport of pesticides in countries like Norway and the Netherlands**3**. The model obtained is used to simulate the direct effects generated by climate change such as the increase in the temperature and the decrease in the rainfall due to the future scenarios. This simulation is proposed according to RCP 8.5 model**4**, where indirect effects such as the increase in the use of pesticides and the use of new wells to supply the water demand in the region are evaluated for the probability of risk of the Arroyo Grande aquifer groundwater. This is to try to contribute to the planning of policies that serve for the sustainable development of the land use as well as the water resource of great socioeconomic potential for the department of Bolívar in Colombia. In this moment the investigation will be start the Development of columns to test the mobility of the organophosphates in soils of the Arroyo Grande aquifer.

# abstracts – day 1 session 2

**Impact of climate change on farm yields and migration in some selected communities in Northern Ghana.**

**Sandra Obiri-Yeboah,**

University of Ghana, Centre for Migration Studies, Legon

The threat of potential reoccurrence and the toll of the associated humanitarian crisis makes climate change a major environmental threat for countries globally. Climate change impact noticeable in extreme weather events negatively affects the lives of the deprived communities, distorting sustainable economic and social relationship within their environment as these people directly depend on the natural environment for livelihoods. In Northern Ghana where the major economic activity is farming, most inhabitants rely solely on agricultural production, creating a distress situation during flooding and droughts. To sustain livelihoods and income, migration becomes a vehicle of positive change to ensuring livelihood sustainability.

The paper examines effect of flooding and droughts on yields and its influence on migration in Yapei in the Central Gonja district and Wungu in the West Mamprusi district within the sustainable livelihood framework context. Using mixed method, simple random sampling was used for the survey while participants were selected using snowballing and convenient sampling for the qualitative data, in depth interviews, focus group discussions and observation were conducted. Interpretative phenomenological approach was used for the qualitative analysis while t-test, correlation and multiple linear regression were used for the quantitative analysis. The results show substantive yield loss from floods and droughts. Migration to the southern parts of the country indicates means of searching for other sources of livelihoods. Also, cost of migration was found to either hinder or make the migratory movement a reality. For rudimentary communities to adapt to climate change impact and thereby achieve good yield, economic and social welfare, strategies such as mixed farming, irrigation mechanism, support from social network, alternative forms of livelihoods and migration are employed.

**Challenges to livelihood practices on the Barotse flood plain following climate change-related shocks.**

**Douglas Singini1** and Craig Janes2

1Douglas Singini, School of Public Health and Health Systems, University of Waterloo, District Health Director for Limulunga District in the Western Province of Zambia

2Craig Janes, School of Public Health Sciences, University of Waterloo.

While the rest of society view floods as a disaster, the Lozi people of the upper Zambezi flood plains welcome flooding with a celebration epitomized by the yearly Kuomboka ceremony that attracts millions of visitors. Tied to the yearly flooding cycle is the livelihoods of over a million people that rely on fishing and winter cropping on the fertile soils and moisture left by the floods and by the receding waters of the Barotse flood plains. However, the effects of climate change have adversely affected the cropping, fishing and yearly movements of the people onto and off the flood plains. Having been unable to generate the income and livelihoods, these people are now among the poorest in Zambia. As in most years the floods have not been high, more settlements on the flood plain have become permanent increasing chances of catastrophes in case of a ‘big’ flood. Access to health services particularly maternal services and other social services are also hampered by flooding. Access to health services is an important challenge in low-income settings where the underutilization of health services has been linked to poor health outcomes.

Notwithstanding our research project titled ‘Impact of flooding on the accessibility and utilization of health services in Western Province, Zambia’ envisages to elucidate the possible novel avenues to increase access to health services. Descriptors for the research include climate change and health systems, decision support, health policy and planning, global health, rural health systems, barriers to health system access, remote sensing, GIS and health and flooding.

To date there has been little research on the impact of flooding on access to health services, yet as the WHO has recently advised, identifying and mitigating the impacts of climate related hazards is essential to building resilient health systems. Our goal is to analyze the impact of flooding on the access to and utilization of health services in Western Province (WP), Zambia, a setting where there has been an increase in the variability and intensity of flooding.

**Mitigation of Environmental Impacts of Hospitality Operations & Tourist Recreational Activities on Lake Malawi in Malawi**

**Michael Bennett Sepula**

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Tourism is regarded as a panacea for economic and social benefits in many countries. Consequently, there is rapid growth of hospitality businesses and tourist recreational activities in Malawi especially along the lake districts – creating an urgent need for environmentally sensitive accommodation service operations and water recreational activities to protect the Lake. Although, Malawi gives tourism/hospitality industry a priority status to catalyse economic growth, there is need for careful planning and appropriate industry development considering both environmental and ecological concerns as a result of the developments. Hospitality operations and tourist recreational activities (HOs /TRAs) consume natural resources, creating waste and depleting the earth’s reserves - impacting on the earth’s ecosystems including Lake Malawi. One serious consequence is changing climate which has significant economic, social and environmental impact on communities owing to their unclear ability or involvement to respond to climate change caused by HOs/TRAs. This study seeks to establish sound mitigation and adaptation strategies with participation of the local communities, focusing on environmental impacts of HOs/TRAs on Lake Malawi in Malawi. Using a qualitative approach, respondents will be selected using purposive, convenience and snowballing sampling. In-depth interviews, focus group discussions with key informants, coupled with observations will. Data analysis will utilize both thematic and phenomenological techniques. The paper argues that there is need to bring into close alignment all sustainable hospitality operations, TRAs and societal transformation models on mitigation and adaptation that will aid in reducing impact on the environment supporting tourism and society.

**Impacts and assessment of climate change in the Isalo National Parks, Southern Madagascar**

**Tsilavo Raharimahefa**1, Nadia J.A. Handoaniaina1, Rino H. Ravelonjatovo2, Elysée S.F. Rakotoarinoro3

1University of Regina, Regina SK, Canada;

1,2,3 Université d'Antananarivo, Antananarivo 101, Madagascar.

It is largely accepted that climate is one of the most important factors that shapes the Earth’s surface. From societal and scientific perspectives, it is therefore crucial to understand how climate variability shaped Earth’s landscapes in order to manage landscapes in the present, but also to anticipate how the landscapes might respond to future climate change. There is a general agreement that weathering and erosional features are primarily controlled by climate variability; as such, they can be regarded as key geological features in understanding and studying the impacts of climate change on the evolution of continental landscapes. The southern part of Madagascar is one of the few places on Earth where impacts of climate change are already being felt and are projected to intensify in the future (e.g., recurrent drought, heavy rainfall and cyclones, flooding and erosion). This makes the regions an ideal place to study the interplay between landscape evolution and climate change. Cavities and pits of various sizes ranging from centimeters to meters scale (Fig. 1) are well-exposed on the Jurassic sandstones of the Isalo National Park in southern Madagascar and endanger the stability of cliffs and protected sites within and around the park. These features are very similar to the well-known cavernous tafoni-type weathering occurring worldwide. However, the origins, evolution, and the major mechanisms responsible for their genesis and development remain unknown. The primary goal of this study is to understand the formation and the development of these undocumented cave-like weathering features in the Isalo National Park, Madagascar.

The research study integrates detailed geological field mapping, morphometry, photogrammetry, structural geology and rock strength analyses, mineralogy/sedimentology, geomorphology and climatology to address the fundamental questions. Our preliminary results indicate: 1- the rate of pitting in the sandstone walls is up to 2 cm/year, suggesting a relatively fast-growing pits; 2- the cavernous weathering features mainly occur on steeply dipping north-south trending walls; 3- the cavernous features are more abundant around fault zones; 4- the size of the pit ranges from 0.09m to 2.82m in height and 0.08m to 2.73m in width, with depth reaching up to 2m. The results from this research study will help in identifying which part of the Isalo National Park are most at risk, and how can we mitigate against the landscape degradation processes in general.

# abstracts – day 1 session 3

**The Accountant and the Climate Action Goal**

**Aryee, Theodora Ekua,** Aboagye-Otchere, Francis, Agyenim-Boateng, Cletus (Supervisors)

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In 2016, the International Federation of Accountants, called for an active involvement in eight out of the seventeen Sustainable Development Goals, one of which is the climate action goal. Climate change has become a main risk to the world, and to businesses. With climate change becoming a key business risk, the accounting profession must consider this change and adequately respond.

Lovell and MacKenzie (2011) argue that the accounting profession is not only relevant in the confines of a firm but generally also plays a constructive role in the wider social processes of any society, which it operates in. Thus, it is important to emphasize the role accountants might be playing in influencing an understanding of the problem, and how they should be leaders in responding and dealing with climate change (Lovell & MacKenzie, 2011; O’Dwyer & Unerman, 2020; Olarewaju, 2021). Therefore, this study seeks to understand the roles played by climate change accounting professionals, such as quantifiers (reporting), verifiers (assurance), and professional accountancy bodies (policy makers) in influencing societal transformation in the Ghanaian context. The study adopts Udo and Jansson (2009) measurement of sustainable development where they combine social, technological, and environmental sustainability measures and group nations into five categories consistent with Maslow’s hierarchy of needs. The study employs the qualitative research approach by conducting semi-structured interviews with accounting professionals, working across different sectors. The study finds that the climate action goal was the least considered by respondents as an area the accountant could play a direct role, revealing very little emphasis on the association between humanity and nature in discussing issues on sustainable development in the Ghanaian accounting profession.

The effort of the Institute of Chartered Accountants Ghana, to be involved in any advocacy for climate change and steering their members in this regard is also minimal. These findings confirm the assertions of Udo and Jansson (2009) that “as in Maslow’s hierarchy of needs, nations that are struggling to survive are less concerned with environmental sustainability than advanced and stable nations.” In terms of the roles played in ensuring climate action, respondents allude to the accountability role played by the accountancy profession to help firms to be accountable for their impact on the climate. Respondents also believed that because climate change has cost implications and affect the going concern assumption of firms, there is the need for the profession to be actively involved, and not just on an ad hoc basis. In summary, the findings suggest that professional accountancy bodies need to be involved in climate change advocacy. This is because they can steer their members toward contributing to climate change mitigation initiatives and reemphasize the environmental aspect of sustainability in the redesigning of the curriculum.

**Drivers of Change and Roles: Smallholder Farmers’ Perspectives on Resource Needs for Climate Change Adaptation**

**Mabel Enyonam Mensah1**, Dr Simon Bawakyillenuo1, Dr Akwasi Mensah-Bonsu2, Prof Felix A. Asante1

1ISSER, University of Ghana, Legon

2Department of Agribusiness and Agricultural Economics, University of Ghana, Legon

This paper examines the imperatives of resources in enhancing adaptation to climate change, using farmers in the transition agro ecological zone of Ghana as a case study. The transition agro ecological zone is one of the biggest food baskets in Ghana, producing staple and cash crops (Antwi Agyei *et al*., 2014; Addai & Owusu, 2014; Nsiah & Sakyi Dawson, 2012; Cudjoe, 2006). There are both indigenous and migrant farmers in this zone with varying resource needs. The objective of this paper is to assess resource availability and use by farmers in the transition zone for adaptation to climate change. The motivation of this paper is to explore what the gaps in resource needs are and which stakeholders are important for climate change adaptation. This could serve as a policy guide for interventions geared towards improving adaptation against the negative effects of climate change. The 7th round of the Ghana Living Standards Survey (GLSS7 data) is the source of secondary data used for analysis in this paper. Primary data was collected from five farm communities purposely selected from Wenchi, Techiman North and Nkoranza South municipals for participatory focus group discussions. Resources owned by farmers and community resources available to farmers were described using frequency and percentage estimations from the GLSS7 data. Thematic analysis was employed in describing information from the participatory focus group discussions on farmers’ perception on climate change, effects of climate change on their activities and resource needs for climate change adaptation. Farmers’ perception on who the drivers of change in the climate action discourse should be and what roles they play or should play are also discussed. Farmers indicated the importance of standardisation and scaling for the sale of farm produce like maize and beans. Good roads for easy access to markets and the need for basic resources like water and toilets in farm communities were also mentioned as key resources for enhancing adaptive capacity against negative climate impacts. Farmers also mentioned access to some form of financial assistance or credit and education on appropriate strategies as important resources. Government, Community Heads, Non-governmental and farmer-based organisations were mentioned as some of the drivers of change in the climate change adaptation process. Resources are important for building adaptive capacity against the negative effects of climate change.

# abstracts – day 2 session 1

**Exploring the Impacts of Urban Expansion on Green Spaces Availability and Delivery of Ecosystem Services in the Accra Metropolis**

Dzifa Adimle Puplampu, **Yaw Agyeman Boafo**.

University of Ghana, Centre for Climate Change and Sustainability Studies, Legon

As Accra, Ghana’s capital city expands at an unprecedented rate, the fragmentation and loss of natural and semi-natural ecosystems may be the greatest challenge to achieving its sustainable development goals. This study investigates the impacts of Accra’s growth and expansion on its natural green spaces’ availability and the delivery of ecosystem services. The study uses remotely sensed imageries (Landsat 1991-2018) for land use change analysis, i-Tree canopy model to quantify and value of urban ecosystems and stakeholder interviews to explore perceptions on green space value. Results showed that the overwhelming number of stakeholders understand and are aware of the beneficial values of urban green spaces but highlight poor planning coupled with land tenure challenges as a threat to the conservation of green spaces. Land use and land cover change analysis shows that the urban built environment has expanded from 55.1% to 83.79% at the expense of the natural environment including green spaces, which have declined from 41% to 15% over 27 years. Existing areas of green spaces including the Achimota forest, the University of Ghana campus and street trees on major roads were valued at US$37,610,980 for carbon sequestration and storage US$1,478,173 for air pollution regulation and US$458 for avoided runoff. A rapid assessment of the availability, accessibility and management of urban green spaces in the Accra metropolis can be an important step towards identifying and mapping their consumptive and non-consumptive use value and introducing appropriate interventions necessary for enhancing the city’s resilience in an era of climate change.

**Pesticide use, climate change and pollinator health: Assessing impacts on cocoa yields in Ghana**

**Enock Dankyi1,** Silas Avicor2, Blessing Umeh3

1Department of Chemistry, University of Ghana

2Cocoa Research Institute of Ghana

3African Regional Postgraduate Programme in Insect Science (ARPPIS), University of Ghana

There is mounting evidence of pollinator declines worldwide largely resulting from anthropogenic activities. In particular, pesticide use, and climate change have been identified as two of the key drivers of pollinator decline. In the global south, the potential impact on the yield of climate- and pollinator-dependent crops such as cocoa poses substantial risks to the economies and livelihoods of millions of farmers. Together, these drivers add to the complexity and vulnerability of insect pollinators and exacerbating the risks to yields of crops. In Ghana, the second-largest producer of cocoa beans worldwide, the cocoa sector employs more than 800,000 families and accounts for about 2 billion dollars in foreign exchange for the country each year. Given the importance of the crop to the economy of Ghana, the cocoa sector receives substantial investments in resources largely through two chemical application programmes: free pesticide application and a high-subsidy fertiliser purchase programme. While these programmes have contributed to yields, there is considerable uncertainty about their exact role and impacts. At the same time, the apparent contradiction in the possible contribution of these agrochemicals to the decline in cocoa yields through pollinator decline appears to have been largely resolved in favour of enhanced pesticide application, through the initiation of a manual hand pollination programme. This seeming neglect of the important role of insect pollinators may have contributed to their gradual decline in populations placing critical ecosystem services such as pollination at risk of collapse.

Consequently, the long-term sustainability of cocoa production is faced with the challenge of ensuring high production while protecting biodiversity. In this presentation, we examine the impacts of pesticide use and climate change in the cocoa ecosystem in Ghana and assess the options for more sustainable cocoa production. The study provides the basis and support for a less-chemical intensive cocoa farming system and climate-mitigating activities that support pollinator health while alleviating the potential long-term negative impact of massive pesticide application.

# abstracts – day 2 session 2

**Navigating Inheritance Rules: Land Access and Climate Change Adaptation**

**Alexander Nii Adjei Sowah1**

1University of Ghana, Legon, Ghana.

Access, use and control of land constitute important steps to adapting to climate variability impacts especially for smallholder farmers within rural communities in Sub-Saharan Africa whose livelihoods are directly connected to land. Access to land is however mediated by contextual architecture of entitlement expressed in inheritance and land tenure arrangements which tend to enhance the rights of certain categories of people within communities whiles curtailing the rights of others. Women are in this way disproportionately affected by the combination of inheritance rules and the increasingly monetized land tenure arrangements. This paper explores the influence of two inheritance patterns – matrilineal and patrilineal- on gendered access to land by smallholder farmers and its effects on their adaptations to climate variability impacts in the Nkoranza South and Bawku West districts of Ghana. Choosing the two areas offered opportunities for comparison. Two considerations were made, first their different ecological zones and second the different inheritance patterns practiced. The paper used data collected through a multi-staged sampling of 798 households in four communities each from the two districts. Using the sequential mixed method approach focused group discussions, household surveys and in-depth interviews of community and family leaders were conducted.

Despite the different inheritance patterns and land right rules and land tenure arrangements within the two districts studied, a striking observation was the influence of patriarchy in the administration of customary land tenure and practices. This guaranteed greater access, use and control of land for men. Women were thus largely consigned to supporting the farming activities of their spouses, fathers and other male relations especially in the Bawku West District due to the strict observation of male inheritance of fixed properties and assets. Entitlement restrictions through non-inheritance of lands by women especially in the Bawku West area limited the scope of adaptive options with consequences on household food provisions and income. Though women in Nkoranza South have unhindered access to land due to matrilineal inheritance patter - inheritance is reckon through the female line – right to use and control lands are sometimes threatened. To navigate the challenges to usury right and control of land, women in Nkoranza South tend to rent or engage in shared cropping arrangement with settlers farmers to keep control of land as lands in use are not appropriated by the matri-clan or maternal family. The monies realized from these arrangements are then invested in off-farm and non-farming enterprises as means of adaptation. Changing land use patterns is also offering other avenues of maintaining control of land such as cashew farming which promises greater returns and more resistant to climate extremes compared to food crops.

**The Effects of Rainfall and Temperature on Malaria Transmission in the Northern Region of Malawi.**

**Rosaliah Mughogho1**, Dr Nana Ammah Klutse2.

1Mzuzu University, Mzuzu, Malawi,

2African Institute of Mathematical Sciences, Accra, Ghana

Malaria is a tropical disease that is caused by a plasmodium which is transmitted through a vector female anopheles mosquito. Malaria transmission is influenced by a number of factors such as socio-economic, environmental, climate and interventions. Climatic factors may play a major role in the transmission of malaria as these other factors are also affected by climate. A better understanding of climatic factors may help to guide the kind and when to give intervention in specific areas. The main objectives of this study is to investigate the variation of malaria transmission driven by climatic factors (rainfall and temperature). The specific objectives are to analyse annual variations of temperature and rainfall with an objective to understand malaria transmission dynamics in the northern region of Malawi, to establish the climatic conditions conducive for Malaria transmission, to predict malaria transmission peak months across the

region and to determine the effects of temperature and rainfall on malaria transmission. Generalized linear models and Poisson regression models were used to analyse data. The results of this study shows that a unit increase in rainfall is associated with 3% increase in malaria transmission. It also showed that every 1OC increase in temperature results to a 3% increase of malaria cases. The study recommends that government and non-governmental organization to prioritize giving interventions to areas experiencing increase in temperature and rainfall.

**Advancing regenerative agricultural ecological intensification of cocoa cropping systems with soil microbial biomass and productivity**

**Eric Kofi Doe1**, Emmanel Morgan Attua1, Amos Kojo Quaye2, Peter Bilson Obour1,

1 Department of Geography and Resource Development, University of Ghana, Legon, Ghana

2 Soil Science Division, Cocoa Research Institute of Ghana (CRIG), New Tafo Akim, Ghana

Intensive agriculture, as opposed to extensive farming, recommends maximization of input use efficiency. Ecological intensive Theobroma Cacao L. (cocoa) farming limits or completely avoids the use of inorganic fertilizers and pesticides while conventional cocoa intensification indulges in inorganic fertilizers and pesticides use besides good agricultural practices. Depending on the input types and ecological attributes, intensive farming can facilitate or hinder natural soil-ecosystem services such as climate change, particularly soil microbial functions that underpin soil nutrient cycling, including carbon (C), phosphorus (P) and crop yield. The paucity of such empirical evidence in cocoa farming impedes current efforts toward improving eco-intensive farming while climate change threatens cocoa climate suitability in Ghana. This study examines the effects of ecological intensive cocoa cropping on soil microbial biomass (SMB-C:P) and yields compared to the conventional intensification (cocoa High-Tech) approach and stakeholder perceptions. Three cocoa Districts, Boinso, Suhum and Papase, were selected using stratified random sampling based on climate-induced gradients. Within each District, 20 farms involving ten eco-intensive and ten High-Tech cocoa farms, were examined. The preliminary results show higher SMB-C:P ha-1 and cocoa yield per tree in the eco-intensive farms than the High-Tech farms, corresponding to stakeholder preference for the former over the latter. However, cocoa-sector policy-makers, the local and international stakeholders continue to promote cocoa High-Tech due to resource constraints for implementing eco-intensive cocoa farming concurrently with low awareness about its regenerative capacity and economic potential. These findings call for rethinking cocoa productivity management efforts to enhance SMB.

Potential for a Sustainable and Inclusive Energy Transition in Côte d’Ivoire: a GenderApproach

 **Wondia Mireille Yeo**Trilateral Chair Transformative Innovation, 4IR and Sustainable Development, University of
Johannesburg, South Africa; QES AS, Open African Innovation Research, University of
Ottawa, Canada

The energy transition is significant for the mitigation of climate change through decarbonisation. Transitions to clean and low-carbon energies are happening worldwide and involve increasing renewable energy sources in the electricity mix and decreasing fossil fuel-based sources. The transition is facilitated by technological advancements which allow the development of decentralised renewable energy technologies and inclusive access to sustainable energy for low-income populations. Energy is an essential factor to realise socioeconomic and environmental development and yet, 548 million people lack access to electricity in sub-Saharan Africa (UN, 2020). This research seeks to understand how the energy transition is happening in Côte d’Ivoire and how it could bring about social, economic, environmental, and inclusive benefits for all. As Swilling, Musango and Wakeford (2016) have argued, any energy transition must be just, inclusive, responsible, and sustainable to achieve social transformations.

This research focuses on gender to investigate how women and men participate in and are affected by the transition towards renewables. There is a great need to understand gender inclusion in the energy transition if we want to simultaneously address the Sustainable Development Goal (SDG) 7 on sustainable energy, and SDG 5 on gender equality. As the emerging academic literature on gender and electricity discusses, a gender-sensitive approach to energy planning is crucial to achieving a sustainable and inclusive energy transition (Buechler et al., 2020). The electricity sector is male dominated, and it is necessary to address the equal participation of women and men in the sector to avoid the reproduction of existing inequalities.

This presentation will address how the energy transition enables the deployment of Payas-you-go (PAYGo) technologies and how this could lead to gender inclusion in Côte d’Ivoire. PAYGo businesses provide access to off-grid solar home systems and allow customers to make flexible payment plans using mobile money. These solutions contribute to a reduction in the use of poor-quality polluting fuels for lighting in rural areas and reach people without access to formal financial services. My research seeks to investigate how PAYGo technologies consider gender in the provision of electricity and how women and men’s needs, experience and behaviour are taken into account. I will discuss the following research question ‘To what extent have PAYGo technologies shaped practices that could enhance gender equality?’. The objective of this research is to examine the gender inclusiveness of pay-as-you-go (PAYGo) solar technologies in Côte d’Ivoire.

My overarching theoretical framework draws from two main bodies of research: Feminist Political Ecology (FPE) and Political Economy. My first contribution is to provide insights into the possibility of an inclusive and sustainable energy transition in Côte d’Ivoire. My second contribution is to fill the gap on the lack of knowledge on energy transitions of francophone African countries.

# abstracts – day 2 session 3

**Sustainable intensification of yam agroforestry systems as an adaptation strategy to climate change for the improvement of food security around the Luki Biosphere Reserve in the Mayombe and Ibi Village on the Bateke Plateau, in DR Congo**

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The Mayombe and Plateau de Batéké regions of the Democratic Republic of Congo (DRC), are subject to differentiated deforestation, which in view of the demographic challenges and in the absence of appropriate measures in terms of land use planning, climate change and innovative agro-ecological production systems could further increase food insecurity and malnutrition in these areas. The traditional practice of slash-and-burn agriculture is commonly used nationwide and across tropical regions as a subsistence farming for smallholder farmers. However, this practice is destructive of the forest and agrosystems, a source of greenhouse and exposes tropical soils to a decline in fertility and consequently to low and unsustainable production. This fact amplified by climate change, reinforces the vulnerability of households in these two study areas to food security. The specific objectives our study are to : 1) analyze the agrobiodiversity of agroforestry systems around the Luki Biosphere Reserve in Mayoumbe and Ibi village on the Batéké Plateau; 2) assess the contribution of yams to household food security and on access to income by women; 3) assess the productivity and the sustainability of yam-based agroforestry systems in pre-forest fallows and improved fallows; and 4) analyze the adoption factors of yam-based agroforestry systems.. In this seminar, we will first present the results of climate change simulations using temperature and rainfall data from the Luki Biosphere Reserve dating back about 60 years. We will then show how climate change combined with other factors such as political and socio-economic factors affect household food security. Finally, we will show how the intensification of yam-based agroforestry systems can reverse the trend and contribute to the empowerment of women farmers.

**Climate change pushing Guatemalan families into food insecurity**

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Guatemala is consistently listed as one of the nation’s most vulnerable to the effects of [**climate change**](https://www.nationalgeographic.com/environment/topic/climate-change). The Global Climate Risk Index 2021 places Guatemala as the 62nd most vulnerable country. Unpredictable climate patterns have resulted in failed harvests and reduced work opportunities pushing many families into food insecurity. Nationally, one out of every two children under five years of age is stunted. Malnutrition is most common in the northern highlands of Guatemala (68.3%). The department of Totonicapán, located in the northern highlands has the highest rate of malnutrition among children under five years (82.2%), 96.7% of the population are indigenous, 71.9% are poor, and its eight municipalities are all considered food insecure; while six of the municipalities have reasonable agricultural potential.

This study aims to characterize food insecurity and coping mechanisms among families living in a rural area of Totonicapán, Guatemala in 2018. Six key informants participated in semi-structured interviews, and 55 families responded to a questionnaire that included demographics, employment, agricultural practices, food purchase habits, food security, and coping mechanisms. Key informants mentioned that rainfall was no longer predictable and crop failures were common. They suggested that diversifying into raising small animals and income generation opportunities for women may be more sustainable over the long-term. Adult family members were commonly agricultural day laborers (36%) or other day laborers (29%). Subsistence agriculture was common, with 40% working their own land in addition to doing day labor. The most common crops were corn (89%) and beans (80%). All families were food insecure to some degree; 15% were mildly food insecure, 50% were moderately food insecure, and 35% were severely food insecure. Coping strategies to deal with food insecurity included migrating (11%), reducing meat and fish consumption (80%), reducing milk product consumption (33%), and eliminating meat consumption (27%). Families also substituted other foods, such as beans (20%), herbs (20%), and vegetables (11%), in place of more expensive foods. Families reported experiencing numerous crises over the past 6 months, including loss or lack of work (29%), sickness or death (26%), and drought (9%); and 93% agreed that these crises affected their access to food. Families commonly attempted to cope with these crises by reducing food portions (42%), eating less preferred foods (64%), selling small animals (31%), and asking family for help (22%).

These results suggest a community experiencing serious food insecurity that puts children at high risk of chronic malnutrition. Policy responses may include supporting economic diversification, including small animal production and women’s small business using traditional skills, such as weaving and embroidery. Supporting local ownership of the production process and facilitating access to international markets for traditional textiles could also support economic diversification.