6TH INTERNATIONAL CLIMATE CHANGE & POPULATION CONFERENCE ON AFRICA

CCPOP-GHANA2018

CCPOP-GHANA 2018

6TH CLIMATE CHANGE CONFERENCE

RIPS

23 - 25 JULY, 2018
LEGON, GHANA

PROGRAMME AND ABSTRACTS

HOSTS

Regional Institute for Population Studies (RIPS)
Climate Change Resource Centre-Ghana (CCRC-Gh)
University of Ghana

INTEGRI PROCEDAMUS

THE UNIVERSITY OF GHANA

History

The University of Ghana, the premier university and the largest university in Ghana was founded as the University College of the Gold Coast by Ordinance on August 11, 1948 for the purpose of providing and promoting university education, learning and research. As a University poised to distinguish itself in the area of research to make an impact at the national and international level, the University has launched a new Strategic Plan. This new strategic plan (2014-2024) is intended to consolidate the gains made from the review of the University's mission and practices and situate these within the context of a very dynamic environment of higher education in Ghana and beyond.

Our Vision

To become a world class research-intensive University over the next decade.

Our Mission

We will create an enabling environment that makes University of Ghana increasingly relevant to national and global development through cutting-edge research as well as high quality teaching and learning

As part of its vision to become a world class research intensive institution, University of Ghana has identified four priority areas where the university will focus and promote international collaboration in research initiatives to enhance the University's research output. These research areas are:

- Malaria Research
- Trans-disciplinary Research into Climate Change Adaptation
- Enhancing Food Production and Processing
- Development Policy and Poverty Monitoring and Evaluation

ABOUT THE REGIONAL INSTITUTE FOR POPULATION STUDIES (RIPS)

Our history and purpose

The Regional Institute for Population Studies (RIPS) was established in February 1972 by the United Nations and hence carried the name United Nations Regional Institute for Population Studies for a period as part of the University of Ghana's Faculty of Social Studies. RIPS came into being in response to the growing demand for regional facilities for population research and training in Africa. This followed a recommendation made by the United Nations Economic Commission for Africa (UNECA) at its Ninth Session in 1968 and subsequent support given by African Governments at the first meeting of the Conference of Ministers of UNECA in February 1971. Prior to this, the United Nations General Assembly Resolution 2211 of 1966 had called for training centres to be established, and for pilot schemes to guide developing countries in devising and implementing population programmes.
The long-term development goal of the Institute is to promote and strengthen research and training in population studies and in the inter-relationships between population and development issues in English-speaking African countries. As well, expanding the boundaries of scientific and development knowledge in these areas comprises the other core business of the Institute.

Vision

To be globally recognised leading centre for excellence in research and training in population health, population, and the environment.

Mission

RIPS' mission is consistent with that of the University of Ghana, and seeks to "build on its core strengths (as) a centre of excellence for high quality teaching and research…to secure and sustain world-class competitive advantages…" (University of Ghana, Legon, Corporate Strategic Plan, p. 11). Our mission statements are:

(i) a commitment to leadership in research on population health, population and the environment.

(ii) employing the most innovative and interdisciplinary methodologies for research and training.

(iii) undertake high quality training and research with outcomes that inform and strengthen policy and developmental issues locally and internationally.

THE CONFERENCE – CCPOP-Ghana2018

In 2012, the Regional Institute for Population Studies (RIPS) at the University of Ghana through the African Adaptation Research Centres of Excellence (AARC) initiative of the International Development Research Centre of Canada instituted the Climate Change and Population Conference on Africa called CCPOP-Ghana. The conference which is wholly organised, managed and hosted by our local scientists was to provide a meeting place for practitioners, policymakers, researchers and politicians to share lessons on population related climate change and adaptation issues that concern Africa towards regional cooperation and integration.

The leadership of the University of Ghana has since supported the conference to ensure that this newly established international niche is sustained for the good of Ghana, Africa and the rest of the world. Since its inception, over 40 different countries globally have been represented including developed countries with keen interest in climate change issues in Africa. Several diplomats and ministers of state as well as lawmakers from some African countries such as Uganda have constantly participated in the conference. It is on record that this international conference held every year at the University of Ghana is the first of its kind on the African continent based on its origin and organisation. Thus the University has demonstrated that given an enabling environment, it is able to deliver even beyond its mandates to engage development and policy actors.

The conference has benefitted the Ghanaian state in so many ways including internal networking of our scientists, joint implementation of research and intervention projects and bridging the gaps between science and policy. Out of this conference has emerged leadership from the University of Ghana who led and contributed to Ghana's Intended Nationally Determined Contributions (INDCs) to the Conference of Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in December 2015. Thus our conference and its outcomes have brought politicians and policymakers closer to the climate change science community at the University of Ghana.

The Regional Institute for Population Studies (RIPS) has therefore shown its resolve to support government initiatives on the issues of climate change locally, nationally and internationally. We are currently undertaking an innovative research project theme "Climate Smart Integrated Flood Management" within seven District Assemblies in GAMA towards having a sustainable response to floods in Accra. This and many such innovations are partially the result of the Climate Change and Population Conference on Africa hence a motivation for us to continue hosting this development-oriented event.

Recent milestones of the environment attest to the urgent need to address climate change, population and development related nuances, for which the Sustainable Development Goals (SDGs), the Sendai Disaster Risk Reduction Framework, and the Paris Climate Agreement have brought momentum to the discussions. As the conference theme "**The Future We Do Not Want**" depicts, we are gathered in Accra, Ghana again to deliberate lessons for African states to provide adaptation solutions to slow down or avoid the most damaging effects of climate change.

The Convener
Benjamin Delali Dovie

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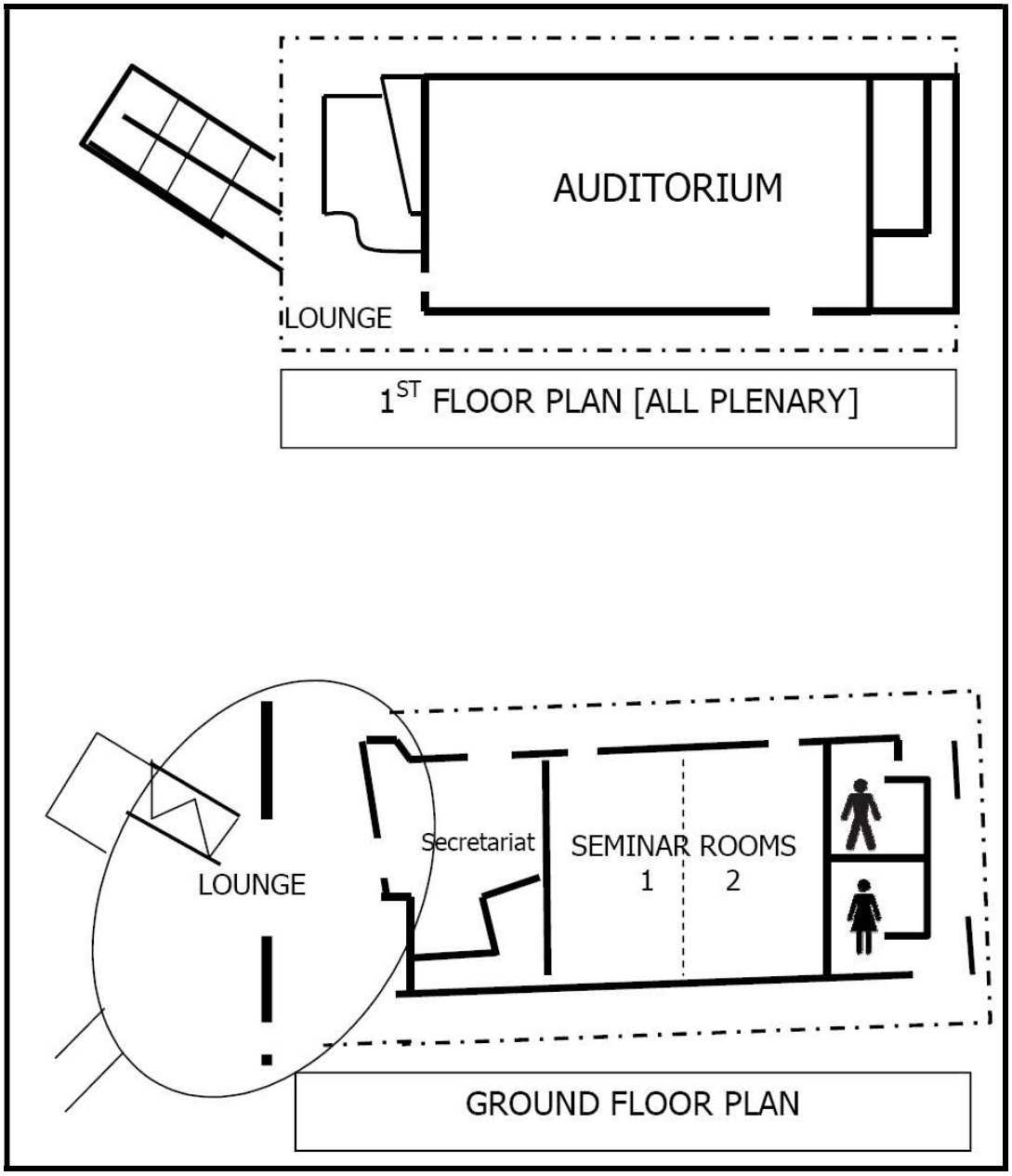
YOUR GUIDE TO THE MEETING VENUE

Noguchi Memorial Institute for Medical Research Conference Centre, Legon



CONFERENCE ORGANISATION AND MANAGEMENT

Local Organising Committee (LOC)

Ms Nana Adwoa Frimpong	Programme Assistant and External Logistics
Mrs Arhizah Blay-Abiti	Internal Coordination and Logistics
Mr Michael Wiredu	ICT Programming
Mr Samuel Quaye	Finance and Registration
Mr Felix Larbi Aryeh	Webmaster
Dr Nancy Akwen	Scientific Programme / Reviews
Dr Benjamin Delali Dovie	Chair and Convener
Dr Philip Antwi-Agyei	Scientific Programme / Reviews

NAME TAG COLOUR GUIDE [SEE BAND BELOW COUNTRY ON YOUR TAG]		
Presenters	Blue / Cyan	
Conference Staff	Yellow	
Invited / Guest Speakers	Red	
Local Organising Team	Black	
Other Attendees / Participants	Plain / White	

THE LOC APPRECIATES THE SUPPORT OF CCRC-GH

GENERAL CONFERENCE INFORMATION & LOGISTICS

Accommodation
The two main accommodations to be used by meeting participants are the University Guest House and Yiri Lodge (African Studies Chalets). They are easy to find once you get to the University of Ghana Campus. You may also inquire from the security post at the main entrance of the university. Note that certain taxis / cars may not be allowed in so let them know that you are attending the Climate Change Conference at Noguchi organised by the University of Ghana. You may call the following number for attention: +233 (0)546264518.

Restaurants
There are several eating places on campus ranging from traditional restaurants "chop bars" to sophisticated settings. The campus accommodations have their own restaurants and bars from which both local and European dishes are available and reasonably priced. Amounts from $5 - $10 should give you an excellent meal around the meeting venue but you must be prepared to spend more for a buffet or extras. You will also find eating places in all the residences on campus, the closest to the meeting venue is the Night Market close to the International Students Hostel. You do not have to go outside the campus to find food. There is also a restaurant bordering the meeting venue.

Transportation
Taxicabs are easily accessible and plying between the University of Ghana Campus and the Legon Lorry Park / bus stop (although just a walking distance), from where you can connect to Accra CBD and other suburbs. In most of the cases, you do not have to hire a taxi. Mini and big buses are also available, again on the University of Ghana campus and the bus stops outside the main University entrance. When in central Accra, you can join any bus or taxi heading towards Madina, Adenta, Atomic, and Ashale Botwe, and get off at the Okponglo Intersection / Legon Bus Stop around the Legon Stadium Complex. This is a short drive to meeting venue.

Shops & Banks
There are various forms of shops in Accra, ranging from table top to kiosks, tuck shops and supermarkets and shopping malls. On campus, you will find smaller shops and tuck shops. Supermarkets are found around the University basic schools, central cafeteria & the international students' hostel, and banks easy to reach on foot. You may also visit the student halls for other services and the central cafeteria around the athletic oval (refer to map). The closest Accra shopping mall is the Accra Mall (about 3 km from the University Campus on your way to the CBD). Get off at the Tetteh-Quarshie interchange and cross left to the Spintex Road.

Pharmacies, drug stores and clinic
These are also available on campus and within some of the halls (e.g. Legon Hall Annex B) where you can purchase simple medications. There is a campus clinic located within the Central Cafeteria. The University hospital is behind the Police Station, opposite the old University entrance which is ready to assist with all cases.

Laundry
The two major laundries on campus are found in the Legon Hall (main) and opposite the Faculty of Arts building on your way to the University Guest Centre. The other is at the Akuafo Hall car park and opposite Crops Science Department. Guest Centres, Lodges / Hotels also offer such service.

Security
Although security is not a serious issue in Ghana, and only involving petty stealing, be alert and call for help. Keep all valuables with you (e.g. credit card, cameras, passports, money, laptop) and beware of roaming taxicabs already with passengers. The Campus Security Help Line is 0285460669 / 0285460668.

Telephone
The campus is full of telephone machines belonging to different telephone operators. Card telephones work on the Vodafone Network whilst MTN operates other forms of services. For international calls, dial 00 followed by the country code and the number. The various GSM / cell phone providers are Tigo, Vodafone, MTN, and Airtel, all that you need is a chip that costs around $0.25, and registration and you are connected to the rest of the world. Vendors are easily located.

Volunteers and other contacts
Please make use of the Volunteers / Protocol at the meeting venue, whose name tags are clearly marked. The language of the Ghanaian is courtesy and not always about rights so observe that and be polite even if you insist on something.

Conference Help line: +233 (0) 547 836 283

DAILY PROGRAMME AT GLANCE

TIME	DAY 1: Monday 23rd July	DAY 2: Tuesday 24th July	DAY 3: Wednesday 25th July
09:00 - 10:00	Ecohealth Network High Level Meeting [UK & African Partners Only]	**Panel 1** [Cities and Climate Change: Imperatives for Action]	**Panel 2** [Deltas, Vulnerability and Climate Change: Migration as Adaptation]
10:00 - 10:30	Conference Opening - Addresses by: • Ghana's communication Minister • Chief Executive, Ghana's Environmental Protection Agency (EPA) • Mayor of Accra		
10:30 - 11:00		**Break / Poster Session 2**	**Break / Poster Session 4**
11:00 - 12:30	Honorary Plenary: Professor Shuaib Lwasa, Makerere University, Uganda **Topic – "Climate and health outcomes in African Cities"**	• **Oral Session 05 – Urban Landscapes**	**Oral Session 09 (Panel 2 Contd)** [Deltas, Vulnerability and Climate Change: Migration as Adaptation]
11:00 - 12:30			**Oral Session 10 – Bridging Gaps between Research and Practice**
11:00 - 12:30		• **Oral Session 06 – Extreme Events**	
12:30 -13:30	**Lunch Break**	**Lunch Break**	**Lunch Break**
13:30 - 15:00	**Oral Session 01 – Governance and Policy Responses**	**Oral Session 07 – Complex Systems**	**Oral Session 11 – Technological Assessments**
13:30 - 15:00	**Oral Session 02 – Climate Change and Ecohealth in Africa**	**Oral Session 08 – Adaptive Strategies and Climate Services**	**Oral Session 12 – Vulnerabilities**
15:00 - 15:30	**Break / Poster Session 1**	**Poster Session 3 / Cocktail Networking Event**	**CONFERENCE CLOSURE**
15:30 - 17:00	**Oral Session 03 – Land Use and Agrarian Change**		
15:30 - 17:00	**Oral Session 04 - Migration as Adaptation**		

DAY 1 (Registration & Official Opening)
MONDAY, 23RD July 2018

08:00 AM: Registration of Conference Participants Starts at the Conference Venue

OPENING CEREMONY— ORDER OF PRESENTATION	
09:30 AM	Arrival of Guests
09:10 AM	All Seated / Opening Prayer, **Rev. Dr Elias Asiama,** *University of Ghana, Legon / Minister, Presbyterian Church of Ghana*
10:00 AM	Guest Introductions **Dr Delali Dovie,** *Conference Chair & Convener, Regional Institute for Population Studies, University of Ghana, Legon*
10:05 AM	Chairperson's Remarks
10:10 AM	Welcome Message **Prof Samuel Codjoe,** *Director of the Regional Institute for Population Studies, University of Ghana, Legon*
10:15 AM	Goodwill Message **Mr John Pwamang,** *Executive Director of Ghana's Environmental Protection Agency*
10:20 AM	Interlude
10:30 AM	Keynote Address **Mohammed Adjei Sowah,** *Mayor of Accra, Ghana*
10:45 AM	Chairman's Response
10:50 AM	Vote of Thanks / Closing Prayer, **Rev. Dr Elias Asiama,** *University of Ghana, Legon / Minister, Presbyterian Church of Ghana*
10:55 AM	Group Photograph

DAY 1
MONDAY, 23RD JULY 2018

PLENARY

PL-01	**Climate Change and Health** *Plenary sponsored by the Ecohealth Network / UK Academy of Medical Sc - GCRF*
Speaker:	**Prof. Shuaib Lwasa** Department of Geography, Geo-Informatics and Climatic Sciences, School of Forestry, Environmental and Geographical Sciences, College of Agricultural and Environmental Sciences Makerere University, Kampala Uganda
Topic:	**"Climate and health outcomes in African Cities"**
Moderator:	**Dr Kwasi Gyau Baffour Awuah** School of the Built Environment, University of Salford, Manchester, United Kingdom
Venue & Time:	Auditorium (first floor) / 11:00 – 12:30 Hrs

Synopsis

In many cities of the developing world, there exists a close link between water, sanitation, and poverty. Climate change is exacerbating this intertwined relationship. With the rapidly expanding African cities, there is growing social, economic and environmental challenges. Environmental burdens, including climate induced flooding, frequent outbreaks of waterborne epidemics, heat waves are now commonly experience and are projected to increase. This presentation will focus on the broader framing of climate-induced health effects in African cities. Cities with "poverty hot-spots" of informal settlements tend to have limited services and infrastructure. Extreme weather events and heat waves influence salient the health outcomes to city residents and have high economic costs, which are both direct and indirect. Economics analysis reveals that the investment in health as basis for protecting urban infrastructure is less expensive compared to the direct and indirect cost of illness.

12:30-13:30 LUNCH BREAK

ORAL PRESENTATIONS

EARLY AFTERNOON [13:30 – 15:00]

SE-01	**Governance and Policy Responses**
MODERATOR	*Gertrude Frimponmaa Owusu*; University of Ghana, Legon, Ghana
VENUE	Auditorium (First floor)
SE-01-01	**Mapping the contribution of Traditional Authorities to climate change adaptation in rural Ghana: The case of Bongo Traditional Area** Raymond A. Atanga[1]* and Thomas Azagsiba Agana[2] *[1]Kwame Nkrumah University of Science and Technology, Ghana, [2]University for Development Studies, Ghana*
SE-01-02	**Policy Responsiveness and Household Adaptation Strategies to Climate Change Impact in the Volta Delta, Ghana** Cynthia Addoquaye Tagoe[1]*, Winfred Nelson[2] and Ruth M. Quaye[1] *[1]University of Ghana, Ghana; [2]National Development Planning Commission, Ghana*
SE-01-03	**Building West Africa's response to Climate change through policies: Emerging issues and trends** Ayodeji O. Ojo[1]* and Isaac B. Oluwatayo[2] *[1]University of Ibadan, Nigeria and [2]University of Limpopo, South Africa*
SE-01-04	**"Much Giving, Much Expected or Less Giving, Much Expected"? Experiences of District Assemblies on Climate Change Adaptation Planning and Implementation in Northern Ghana** Asaah S. Mohammed and Jonas Akudugu *University for Development Studies, Ghana*
14:50-15:00	**General Discussion & Conclusion**

SE-02	**Ecohealth Network:** Ecohealth Field Building at The Nexus of Climate Change, Urban Sustainability and Resilience of Cities in Africa
MODERATOR	**Benjamin Delali Dovie[1], Kwasi Awuah Baffour[2]** *[1]Regional Institute for Population Studies, University of Ghana, Legon, Ghana* *[2]School of Built Environment, University of Salford, Manchester, United Kingdom*
VENUE	Seminar Rooms 1 / 2 (Ground floor)
Partners	1. University of Ghana, Legon, Ghana 2. University of Salford, UK 3. University of Makerere, Uganda 4. University of Ouagadougou, Burkina Faso 5. University of Yaoundé, Cameroon

15:00-15:30 BREAK

ORAL PRESENTATIONS

LATE AFTERNOON [15:30 – 17:00]

SE-03	**Land Use and Agrarian Change**
MODERATOR	*Professor Jephias Matunhu*; Midlands State University, Zimbabwe
VENUE	Seminar Rooms (Ground floor)
SE-03-05	**Enhancing adaptation of smallholder production systems to climate variability through an integrated approach: A case of horticultural producers in Ghana** Portia A. Williams[1,2]*, Olivier Crespo[1], and Mumuni Abu[3] *[1]University of Cape Town, South Africa [2]CSIR - Science and Technology Policy Research Institute, Ghana [3]University of Ghana, Ghana*
SE-03-06	**Multidimensional household vulnerability assessment in semi-arid areas of Mali** Alcade C. Segnon[1,2,3]*, Edmond Totin[2,4,] Robert Zougmore[2], Enoch G. Achigan-Dako[3], Ben Ofori[1] and Chris Gordon[1] *[1]University of Ghana, Ghana; [2]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Mali; [3]University of Abomey-Calavi, Benin; [4]Université Nationale d'Agriculture du Benin, Benin*
SE-03-07	**Implications of Land Tenure Rights on Crop Farmers' Choice of On-Farm Adaptation Strategies in Lawra District of North-West Ghana** Francis A. Akugre *University of Ghana, Ghana*
SE-03-08	**Potential Impact of Climate Change on Yields of Cereals in Nigeria** Ajetomobi J. Olusegun* and Gbadegesin A. Sulaiman; Ladoke Akintola *University of Technology, Nigeria*
16:50-17:00	**General Discussion & Conclusion**

SE-04	**Migration as Adaptation**
MODERATOR	*Dr Margaret Delali Badasu*; University of Ghana, Legon, Ghana
VENUE	Auditorium
SE-04-09	**Climate Change impact triggered Population movement in Tanzania** Elizabeth Lulu Genda *Mzumbe University, Tanzania*
SE-04-10	**Indigenous knowledge and climate adaptation among maize crop farmers in southwest Nigeria** Habeeb O. Abdulateef and Tolulope Osayomi *University of Ibadan, Nigeria*
SE-04-11	**Climate-change induced migration in the semi-arid South Eastern Zimbabwe: patterns and effects on rural livelihoods** Varaidzo Chinokwetu *Chinhoyi University of Technology, Zimbabwe*
SE-04-12	**Utopia Thinking and The Imaging of Green Eco-Friendly Cities in Sub Sahara Africa** O. J. Omirin *University of Ibadan, Nigeria*
16:50-17:00	**General Discussion & Conclusion**

DAY 2
TUESDAY 24TH JULY 2018

PANEL

PN-01	**Cities and Climate Change (Imperatives for Action)** *Panel co-sponsored by the Climate Change Resource Centre at RIPS (CCRC-GH), University of Ghana, Legon Ghana; and the Centre for Human & Environmental Security (CHES), Accra, Ghana*
Speakers	**Faustina Frempong-Ainguah,** University of Ghana, Legon, Ghana **Opoku Pabi,** University of Ghana, Legon, Ghana **Mumuni Abu,** University of Ghana, Legon, Ghana
Topic	**Managing socio-demographic change and climate induced flood risks in the Greater Accra Metropolitan Area**
Moderator	**Benjamin Delali Dovie,** University of Ghana, Legon, Ghana
Venue & Time	Auditorium / 09:00 – 10:30 Hrs

SYNOPSIS

Safeguarding the sustainability of urban planning to deliver on resilience amidst multiple stresses in cities particularly sums up challenges faced by city planners globally, aggravated by disasters and climate extremes. This will require transactional and proactive knowledge to effectively build urban resilience against hydro-climatic risks. Societal demand has outpaced service supply and related physical infrastructure, against challenges such as population growth and poverty. Therefore, there is the need for new and enhanced approaches to city planning and management that defy administrative and urbanization barriers. The world is witnessing the reality of the negative effects of typical regional planning models rather than systems-wide and right-based approaches that integrate adjoining “regions and landscapes” into planning. Slum areas suffer most because they often occupied low lying areas. Climate-smart integrated flood management (CSIFM) for example will enhance climate change mainstreaming and promote infrastructure designs that rely on resilient indicators, gender equity and climate elements to shut the cost associated with hydro-climatic disasters. The session will discuss enablers of intersectoral collaboration, mechanisms and facilities for vertical and horizontal coordination, technocratic approaches, integrated understandings of population dynamics, use of scientific evidence in decision making, and balances in community, governance arrangements and the strategic civil and private sector input to decision-making for informed adaptation. The session is intended to bring together key actors from academia, civil society, national governments and the private sector to analyse gaps, opportunities, synergies and trade-offs in the cities-climate-change nexus in the Greater Accra Metropolitan Area in Ghana.

10:30-11:00 BREAK

LATE MORNING [11:00 - 12:30]

SE-05 **Urban Landscapes**
MODERATOR *Varaidzo Chinokwetu*; Chinhoyi University of Technology, Zimbabwe
VENUE Auditorium

SE-05-13 **Urban Expansion, Wetland Resources Depletion and Population Changes: A Geo-Spatial Assessment of Lekki – Ajah Coastal Zone, Lagos, Nigeria**
Alabi Soneye* and Akinlabi Akintuyi
University of Lagos, Nigeria

SE-05-14 **Greenhouse gas reduction pathways in urban sectors focusing on food waste in hospitality industry in Kenya**
Gakii Mugendi
Food Smart Africa, Kenya

SE-05-15 **Flood Disaster-Induced Residential Mobility in Ibadan, Nigeria**
A.M. Alabi
University of Ibadan, Nigeria

SE-05-16 **Impact of Urbanization on Climate Change and the Inhabitants of Benin City, Nigeria**
Odjugo P.A. Ovuyovwiroye
Nigerian Meteorological Agency, Nigeria

12:20-12:30 **General Discussion & Conclusion**

SE-06 **Extreme Events**
MODERATOR *Dr Alexio Mbereko*; Women's University in Africa, Harare, Zimbabwe
VENUE Seminar Room (Ground floor)

SE-06-17 **How will Climate departure influence future changes in crop suitability over West Africa?**
Temitope S. Egbebiyi*, Olivier Crespo and Chris Lennard
University of Cape Town South Africa

SE-06-18 **A spatially varying coefficient zero-inflated Poisson modelling of cholera incidences**
Frank B Osei*, A. Stein
University of Twente, Netherlands

SE-06-19 **The Impact of Precipitation Effectiveness Indices and Agricultural Planning in Northern Part of Bauchi State-Nigeria**
A. I. Abdulhamed and S.U. Usman
Dutse Federal University, Nigeria

SE-06-20 **The rational approach for citizens of Khartoum to adapt and cope with the extreme events in the context of climate Change**
F.M. Ismail
University of Khartoum, Sudan

12:00-12:30 **General Discussions & Conclusion**

12:30-13:30 LUNCH BREAK

ORAL PRESENTATIONS

EARLY AFTERNOON [13:30 – 15:00]

SE-07	**Complex Systems**
MODERATOR	*Professor Alabi Soneye*; University of Lagos, Lagos, Nigeria
VENUE	Seminar Room (Ground floor)
SE-07-21	**Reclassification of Agroecological Zones for Parkland vegetation: An Assessment of Climate Change Impact in Nigeria** Ibrahim N. Abdullahi*, Alex Vierod, Andrew Packwood and Mark B Rayment *Bangor University, United Kingdom*
SE-07-22	**Assessing the climatic impact on the Owabi hydrological basin in Ashanti region, Ghana** Marian A. Osei*, Leonard K. Amekudzi, David D. Wemegah, Kwasi Preko *Kwame Nkrumah University of Science and Technology, Ghana*
SE-07-23	**Regime shift and interplay: towards more robust social-ecological systems** Therezah Achieng*, and Kristine Maciejewski *Stellenbosch University, South Africa*
SE-07-24	**Implications of climate change induced schistosomiasis burden on gender and family structures in determining risk and vulnerability: A case study of Ntalale ward, Zimbabwe** [1]Alexio Mbereko, [2]M.J. Chimbari, [2]S. Mukaratirwa *[1]Women's University in Africa, Zimbabwe, [2]University of KwaZulu-Natal, South Africa*
14:50-15:00	**General Discussion & Conclusion**

SE-08	**Adaptive Strategies and Climate Services**
MODERATOR	*Dr Jonathan D. Quartey*; Kwame Nkrumah University of Science and Technology, Ghana
VENUE	Auditorium
SE-08-25	**Choice of Climate Change Adaptation Strategies under Various Land Tenure Systems** Xorladem K. Buku Kodjo*, Yaw Osei-Asare, Alhassan W. Seini *University of Ghana, Ghana*
SE-08-26	**Indigenous flood management mechanisms in Ibadan, Nigeria** Bolanle Wahab*and Olusegun Fowora *University of Ibadan, Nigeria*
SE-08-27	**Enhancing Climate-Smart Agriculture in Northern Ghana through Ecosystem-Friendly Farm Practices: Insights from Irrigation Scheme-Types** Caesar Agula*, Edmund Kanmiki, Akua Obeng-Dwamena and Ayaga Bawah *University of Ghana, Ghana*
SE-08-28	**Climate Change: Towards Improved Water Availability for Rural Development in Zimbabwe** Jephias Matunhu *Midlands State University, Zimbabwe*
14:50-15:00	**General Discussion & Conclusion**

DAY 3
WEDNESDAY 25TH JULY 2018

PANEL PN-02	**DEltas, vulnerability and Climate Change: Migration as Adaptation (DECCMA)** *Panel Sponsored by IDRC DECCMA Project, RIPS, University of Ghana*
Chairperson	**Hon. Clement Humado** Member of Parliament for Anlo Constituency, Volta Region, & Former Minister for Food and Agriculture, Ghana
Topic	**Deltas, Climate Change and Migration**
Conveners	**Prof. Samuel N.A Codjoe[1]; Prof. Kwasi Appeaning Addo[2]** [1]Regional Institute for Population Studies, [2]Department of Marine and Fisheries Sciences, [1,2]University of Ghana
Venue & Time	Auditorium / 09:00 – 10:30 Hrs

SYNOPSIS

Globally deltas are home to about 500 million people. However, it is estimated that by the year 2050, a minimum of 1 million people will be displaced by current sea-level trends within these deltas. Inhabitants of deltas experience multiple hazards namely coastal erosion, flooding, drought and salinization. The Volta Delta for instance, is an area of intense economic activity including commercial agriculture and the exploitation of resources such as salt. Threats of habitat fragmentation, unplanned human settlement, salt water intrusion, siltation and destruction of mangroves are the key challenges in the Delta catchment. The DECCMA project has as its main aim to evaluate the effectiveness of adaptation options and to assess migration as an adaptation option in deltaic environments under a changing climate. This is in order to deliver policy support to create the conditions for sustainable gender-sensitive adaptation. To achieve these, key stakeholders within the Volta delta have been engaged at the community, district and national levels. A household survey on migration and adaptation as well as biophysical assessment and socioeconomic analysis have been conducted through the project. This session will discuss the biophysical and socio-ecological evolution of the Volta Delta defined by the 5m contour, taking into consideration governance and policy response to environmental challenges. It will focus on the interactions between biophysical processes and anthropogenic activities in the delta. The session will further discuss findings on adaptation practices and migration patterns of populations in response to the biophysical and socio-ecological changes in the Volta Delta. We intend to bring together key actors from academia, civil society, national government and the media. The discussions will focus on sharing experiences and findings from the research project to inform policy and similar future research endeavours.

10:30-11:00	**SNACK / TEA / COFFEE BREAK**
SE-09	**DEltas, vulnerability and Climate Change: Migration as Adaptation**
VENUE	Auditorium

LATE MORNING [11:00 - 12:30]

SE-10	**Bridging Gaps between Research and Practice**
MODERATOR	*Dr Naa Dodua Dodoo*; University of Ghana, Legon, Ghana
VENUE	Seminar Room (Ground floor)
SE-10-29	**Climate Change, Pollution, And Economic Growth: An Autoregressive Distributed Lagged Model (Ardl) Approach** John Sylvester AFAHA* and Oluwasola Oni *Caleb University, Nigeria*
SE-10-30	**Impact of the MJO on tropical precipitation** Michael Baidu[1]* and Adrain Tompkins[2] *[1]Ghana Meteorological Agency, Ghana, [2]The Abdus Salam International Centre for Theoretical Physics (ICTP), Italy*
SE-10-31	**The relevance of climate finance flow on agriculture production in Ghana** Prince K. Bansah *University of East Anglia, England, and Global Peace Advocacy, Ghana*
SE-10-32	**GIS Based Carbon Sequestration Estimation in Buska Mountains Forest: (Exemplary Adaptation and Mitigation Experience) in Southern Ethiopia** Solomon Desalegn Kibret *Climate Change Consortium of Civil Societies in Ethiopia, Ethiopia*
12:20-12:30	**General Discussions & Conclusion**
12:30-13:30	**LUNCH BREAK**

ORAL PRESENTATIONS

EARLY AFTERNOON [13:30 – 15:00]

SE-11	**Technological Assessments**
MODERATOR	*Kodjo X. Buku;* University of Ghana, Legon, Ghana
VENUE	Auditorium
SE-11-33	**Exploring the boundaries of sustainable service delivery model in the adoption of solar PV solutions in informal settlements: Case studies from South Africa and Ghana** Kweku Koranteng*, Daimain Conway and Blake Robinson *Stellenbosch University, South Africa*
SE-11-34	**Climate Change and Clean Energy Demand in Africa: The Way Forward for Policy Development** Jonathan D. Quartey *Kwame Nkrumah University of Science and Technology, Ghana*
SE-11-35	**Hybrid Off-grid Renewable Power System for Sustainable Rural Electrification in Benin** Thierry O. Odoui[1]*, Bhandari Ramchandra[2], Rabani Adamou[2]; *[1]Abdou Moumouni University, [2]Cologne University of Applied Sciences, Germany*
SE-11-36	**Assessing Water Security in the Sisili-Kulpawn Basin of the Northern Region of Ghana** Jamaldeen M. Gariba* and Joseph Amikuzuno *University for Development Studies, Ghana*
14:50-15:00	**General Discussion & Conclusion**

SE-12	**Vulnerabilities**
MODERATOR	*Professor Blaise Nguendo-Yongsi*; University of Yaoundé II – Cameroon
VENUE	Seminar Room (Ground floor)
SE-12-37	**Effects of climate change on farming communities in the Delta areas of Ondo State, Nigeria** Afolabi Aribigbola *Adekunle Ajasin University, Nigeria*
SE-12-38	**Effect of Climate Change Adaptation Strategies on Income Inequality among Cocoa Farmers in Central Region of Cameroon** Abayomi Samuel Oyekale *North-West University, South Africa*
SE-12-39	**Effect of Climate Change Adaptation Strategies On Farmers Income in Kwara State, Nigeria** A.O. Olajide[1,] K.K. Osasona[2]* and M.F. Salami[2] *[1]University of Ibadan, Nigeria, [2]University of Ilorin, Nigeria*
SE-12-40	**Analysing households' vulnerability and coping to climate-induced stresses in coastal Bangladesh: an asset-based analysis** Mehedi Mudasser and Md Z. Hossain *Khulna University, Bangladesh*
14:50-15:00	**General Discussion & Conclusion**

15:00 Hours
CLOSE OF DAY 3 & END OF CONFERENCE

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ORAL & POSTER PRESENTATION ABSTRACTS

ORAL ABSTRACTS FOLLOW THE ORDER IN WHICH THEY APPEAR IN THE PRESENTATION SCHEDULE

Presented By

Regional Institute for Population Studies (RIPS)
University of Ghana, Legon, Ghana

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ORAL ABSTRACTS [SE-01 TO SE-12]

Monday 23rd Presentations

SE-01
Governance and Policy Responses

SE-01-01

Mapping the contribution of Traditional Authorities to climate change adaptation in rural Ghana: The case of Bongo Traditional Area

Raymond A. Atanga[1] and Thomas Azagsiba Agana[2]*
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Evidence show that the poor and natural resource-dependent households bear a disproportionate burden of the adverse effects of climate change. Many of these poor households who live in rural areas rely on traditional institutions for their adaptation. Constructed from the values and cosmovisions of local people, traditional institutions such as chieftaincy, has the potential to stimulate and sustain positive adaptation in the face of daunting climatic risk. In Ghana, traditional authorities have served as custodians of indigenous culture and knowledge systems and facilitated the development of their communities in diverse spheres. There is an increasing recognition of the important role of traditional systems in the climate change adaptation debate. However, the contribution of traditional authorities to the adaptation process in rural areas has received little attention in academic and policy cycles. Therefore, the paper discusses the contributions of traditional authorities to climate change adaptation in rural Ghana. Using the Bongo Traditional Area as a case study, key-informant interviews, field observations and focus group discussions were conducted. The results revealed the active involvement of traditional leaders in climate change adaptation programmes in Bongo Traditional Area. For instance, the Chief of Bongo has facilitated changes in traditional norms and attitudes that impeded local adaptation. Similarly, the traditional authority has fostered partnerships with local and international stakeholders which have supported local level adaptation initiatives. The findings exemplify the important roles that traditional authorities play in climate change adaptation in rural settings in Ghana. It further suggests that adaptation to climate change impacts cannot occur in an institutional vacuum and that adaptation at the household levels is shaped by local institutions.

SE-01-02

Policy Responsiveness And Household Adaptation Strategies To Climate Change Impact In The Volta Delta, Ghana

Cynthia Addoquaye Tagoe[1], Winfred Nelson[2] and Ruth M. Quaye[3]*

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Coasts and deltas are important ecosystems and choice locations for human settlement and economic activities. However, these areas are predisposed to the impacts of climate change especially sea-level rise, floods and salinization which affect the livelihoods of residents and have implications for government's expenditure. Ghana's east coast is particularly vulnerable to erosion and flooding and has experienced a heightened vulnerability in recent times with its accompanying governmental interventions. This paper therefore explores government's response and households' adaptation strategies to climate change impact in the Volta Delta. The paper draws on the experiences of 1,364 randomly-selected households in nine (9) districts within the Volta Delta with diverse livelihoods beyond agriculture and engagement with 71 purposively-selected local and national stakeholders in policy development. The results indicate that, although migration is one of the least preferred adaptation choices, people who migrated tend to stay for long periods in their destinations. The results further indicate that one-fifth of women sampled in the delta engaged in economic activities due to climate change and less than one in ten respondents moved to higher or safer places. On the policy level, it was observed that though, there have been improved policies on social protection, gender, development, education and awareness creation, there was still more to be done in improving coastal management, disaster risk reduction and occupational diversification away from agriculture. The paper therefore recommends the full implementation of interventions on coastal protection, gender and disaster, in order to protect the livelihoods and properties of residents in the deltaic region.

SE-01-03

Building West Africa's response to Climate change through policies: Emerging issues and trends

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The need to formulate and implement evidence-based agricultural policies towards building climate resilient economies cannot be overemphasised. This is coming at a time when global policy makers are advocating for proactive responses to climate change. Climate change remains an economic and environmental challenge that stares the development of Africa in the eye. Climate change being a threat multiplier affects all sectors of the economy. This is the case as African continent is reliant on primary products with low level of technology adoption. This study therefore examined the climate change adaptation policies and programmes in West Africa. The study utilised secondary data

from World Bank, FAO, UNFCC and other agencies. The study covered 15 West African countries. Currently, West Africa bears a disproportionate burden of adverse climate change impacts. The impacts materialise through resource conflicts, low productivity, crop failure and livestock failure among others. The study found Nigeria, Ghana, Togo and Benin among others had climate adaptation policies at different levels of implementation. The study found poor budgetary allocation, research and development, infrastructure deficits and paucity of data were the challenges of climate change adaptation policy implementation in West Africa. Based on the findings of the study, there should be co-create and collaborate on regional climate change adaptation policies to be implemented across all West African countries. There is the need to increase climate financing and research.

SE-01-04

"Much Giving, Much Expected or Less Giving, Much Expected"? Experiences of District Assemblies on Climate Change Adaptation Planning and Implementation in Northern Ghana

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Ghana has taken several steps to combat climate change including the development of a National Climate Change Policy, National Climate Change Adaptation Strategy and Disaster Risk Reduction Plan. These initiatives are expected to be mainstreamed into Medium Term Development Plans of Metropolitan, Municipal and District Assemblies (MMDAs). However, since this decision was taken, there has not been any comprehensive study to assess the mainstreaming of climate change action plans into the medium term development and the level of implementation of these interventions. Consequently, we do not know the degree to which climate change issues are mainstreamed into the medium term development plans of Municipal and District medium term development plans in Ghana. In addition, the level of implementation of climate change action plans in the Districts is not known. This study seeks to fill this knowledge gap by assessing the level of mainstreaming and implementation of climate change action plans in selected Districts in Northern Ghana. This is particularly important because it is in Northern Ghana where climate change impacts are more pervasive. This study employed mixed methods approach to collect qualitative and quantitative data from various sources. Trend analysis of national annual performance assessment report of MMDAs was conducted. Key informant interviews were conducted with the MMDAs and other stakeholders in the fight against climate change in Northern Ghana. The findings show growing mainstreaming of climate change adaptation in annual plans of District Assemblies however, with less implementation. The paper recommends that climate change adaptation programmes should be given specific funding from central government. CSOs in the climate change sector should also collaborate with districts in planning and implementation of climate change programmes.

SE-02
Climate Change and Ecohealth in Africa

Health, well-being and livelihoods of populations vulnerable to climate change incidences such as increased weather events that result in floods and accompanied severe losses and damages, in urban areas are being compromised. This is partly due to existing exposures such as poverty and high population densities. This means that additional external burden confronts the health of societies and the environment in urban areas already faced with severe land degradation, disruption in energy and water resources from urbanization, and the inability of urban managers to keep pace with societal needs. New forms of diseases are emerging and attributed to impacts of climate change and climate variability on social-ecological systems that must be understood to assure quality of health and well-being of vulnerable populations and urban landscapes. Yet, huge gaps in knowledge exist in linking improved health and ecosystem conditions to better urban practices, including improving adaptability to climate change, for strengthening abilities to detect and respond to emerging infectious diseases, and preventing the spread of vector-borne diseases like malaria. Therefore, this Network seeks to bring together persons of diverse backgrounds already doing research on the intersection of health, environment and development to bring new understanding to ecohealth, climate change and urban sustainability for finding solutions to emerging challenges and problems. The Network's activities are built on existing research of individual network members with outcomes that support SDG 3 (on health and well-being), SDG 11 (resilience of cities), SDG 12 (consumption and production patterns) and SDG 13 (on climate action).

SE-03
Land Use and Agrarian Change

SE-03-05

Enhancing adaptation of smallholder production systems to climate variability through an integrated approach: A case of horticultural producers in Ghana.

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Agriculture in Africa is vulnerable to climate variability and change due to its overreliance on rain-fed agriculture. Although numerous potential adaptation options have been identified as a result of increase in research on vulnerability and adaptation, African countries including Ghana have not realized its full potential in adapting to climate variability and change. Factors contributing to climate vulnerability differ between places, sectors and communities. With limited studies on how vulnerable smallholder horticultural production systems are to climate variability, the study aimed at evaluating vulnerability of smallholder producers in two distinct districts in Ghana applying the Livelihood Vulnerability Index (LVI). A total of 480 households engaged in fruit and vegetable crop production were surveyed in Keta and Nsawam districts of Ghana. Using composite index, data collected were aggregated and compared. Generally, the results of aggregate scores

indicated that, Keta had a higher LVI (0.395) than Nsawam (0.378). The highest level of vulnerability (score>0.5) was exhibited in Keta for natural disasters (0.604) and food availability (0.512) while social networking in Nsawam (0.554) was highest. To enhance future planning and policy discussions on adaptation of smallholder farmers to changing climate, identification and assessment of effectiveness of adaptation options to manage climate variability is recommended. Decision on eventual selection and implementation of suggested adaptation practices particularly for smallholder farmers should be guided given their limited resources to improve vulnerability assessments and enhance adaptation among smallholder farming households to impacts of climate variability and change.

SE-03-06

Multidimensional household vulnerability assessment in semi-arid areas of Mali

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West Africa semi-arid areas (SARs) are hotspots of climate change, with strong ecological, economic and social impacts, making socio-ecological systems particularly vulnerable. However, vulnerability in SARs is not driven only by climatic factors. In addition to climate, other biophysical, socioeconomic, institutional and political driving forces, operating at different scales, interact to influence vulnerability. This inter-connected nature of vulnerability in SARs has, however, received little attention in vulnerability assessment. This study adopted a modified Livelihood Vulnerability Index approach which include non-climatic dimensions and framed within the IPCC vulnerability framework. This multidimensional approach which offers a pragmatic and flexible tool for vulnerability assessment was used to assess household vulnerability to climatic and non-climatic stressors. Empirical data collected from 501 households in a SAR of Mali were analysed using Factor Analysis of Mixed Data combined with Hierarchical Cluster Analysis to explore differential household vulnerability. The typology revealed five household vulnerability categories, differentiated based on sociodemographic profile, livelihood strategies, social network, resources and energy, physical accessibility, food security, health and sanitation, water security, environmental as well as socioeconomic shocks. Availability of productive household members and resources, particularly land and livestock, livelihood diversification and diversity of support from social networks are the main discriminant factors of household adaptive capacity. Challenges to get food throughout the years make household more sensitive to shocks. The main shocks to which households in the study areas are exposed to include respectively drought, food scarcity, livestock disease, crops' damage by transhumant herders and lack of labour. The analysis highlighted the diversity in household vulnerability and the context-specific nature of driving forces of vulnerability in SARs of West Africa. Failing to account for this diversity and nuanced understanding in adaptation planning may result in a mismatch between adaptation needs and interventions and poor impacts of adaptation interventions.

SE-03-10

Implications of Land Tenure Rights on Crop Farmers' Choice of On-Farm Adaptation Strategies in Lawra District of North-West Ghana.

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Land tenure rights have the great potential to influence farmers' adaptation decision making. In order to enhance effective and sustainable adaptation among farmers, it is important to identify and understand how key variables like land tenure rights influence farmers adaptation to the impacts of climate variability and change especially in semi-arid north-western Ghana where there is high incidence of vulnerability. Therefore using a quantitative approach, the study examines the influence of land tenure rights on crop farmers' choice of on-farm adaptation practices to climate variability and change in the Lawra District of semi-arid north western Ghana. A multi-stage sampling procedure was employed in obtaining 192 crop farming households for the study. Results of a binary logistic regression model showed that, farmers' on-farm adaptation decisions were partly influenced by their land tenure rights and their socio-demographic characteristics including location, household size, sex, access to agricultural extension services and whether one was a native farmer or migrant farmer other than just only land tenure rights. It is recommended that climate change adaptation policy makers, particularly in relation to the agricultural sector, should design community based adaptation policies and projects that will meet the adaptation needs of various social groups of the farmers particularly with regards to improving agricultural extension and education in all communities and among all social groups of the farmers whilst improving access to land and tenure security.

SE-03-11

Potential Impact of Climate Change on Yields of Cereals in Nigeria

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In recent time, global warming conditions have increased and led to several forms of economic losses in different countries. Financially, Nigeria has been the most affected in West Africa. In the absence of adaptation, climate change could result in a loss of between 2% and 11% of Nigeria\'s GDP by 2020, rising to between 6% and 30% by the year 2050. This study examined the potential effects of climate change on the yields of cereals in Nigeria. The research involved the use of a pooled panel data of various states producing each crop over the period of 1991-2016. The study utilized Cobb-Douglas production risk model developed by Just and Pope for yield estimation in the analysis. A panel unit root test and Maximum Likelihood Estimation technique were used to obtain reliable estimates of the model's parameters. The results showed that extreme temperature was negatively related to the average yield of three of the cereals (rice, sorghum, and maize). A 1% increase in extreme temperature decreased the yield of maize, sorghum and rice by 0.01%, 0.02% and 0.03% respectively. Rainfall was also observed to have negative

effects on rice and sorghum. Rainfall elasticities for these crops were 5.11 and 2.52 respectively which implies an increase in rainfall by 1% will decrease the yield of rice and sorghum by 5.11 and 2.52% respectively. It is noteworthy that both temperature and precipitation also influenced variability in the yield of all the crops. A 1% rise in extreme temperature increased yield variability of rice and maize by 2.58 and 4.7% respectively. However, it had a negative effect on millet yield variability which decreased by 6.06% with a 1% rise in temperature. A 1% increase in extreme rainfall caused maize yield variability to increase by 6.33%. The increase in crop yield variability could result in wide fluctuations in crop production and make price unstable as well as have some implications on planned climate adaptation initiatives for cereals' productivity.

SE-04
Migration As Adaptation

SE-04-09

Climate Change impact triggered Population movement in Tanzania

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This paper dealt with climate change and population movement in Tanzania. The objective was to examine population movement in the context of climate change among pastoral Maasai women. The study was conducted in Dar es Salaam city and in Coast region. Purposive sampling was used in selecting 8 wards in the city and 4 wards in rural areas. Responses were obtained by interviewing all Maasai women who were found doing petty business in the city and rural areas. Snowball technique was used to obtain the desired 200 respondents. Major economic activities of the Maasai women in rural areas were livestock keeping, crop cultivation and some petty businesses. Those in the City were involved in petty selling of traditional medicine, beads, jewellery, earrings and tobacco. Reasons for movement were adverse climate change due to unreliable rainfall; overgrazing; government policies of changing the use of Maasai land. In the city the pulling factors include; the availability of markets for Maasai traditional goods and presence of friends and relatives who accommodated the newly arrivals. The paper concluded that Climate change stresses increases poor people mainly women to choose short term temporary movement as permanent mitigation action. The study recommended that the government and NGOs should help Maasai pastoralist to practice dairy cattle in their areas of origin to produce more milk to sell for their family up-keep. Local Government Authority should; provide a better area for Maasai women to display their goods and ensure security; make interventions of entrepreneur training for rural Maasai women who are doing petty businesses; consider poor people to be centre to the climate change agenda; ensure mitigation, adaptation, loss and damage actions deliver for and do not compromise the development choices of the poorest.

SE-04-10

Indigenous knowledge and climate adaptation among maize crop farmers in southwest Nigeria

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Maize yield, in recent times, has been greatly affected by climatic variations in many parts of the world including Nigeria. In light of this development, maize farmers in Nigeria relied on their indigenous knowledge base and developed local adaptation strategies to deal with the current trend. To this end, this study therefore examined the role of indigenous knowledge and methods adopted by farmers in maize cultivation within the context of a changing climate with a view to incorporating local knowledge/techniques in climate adaptation plans. To this end, a questionnaire survey of 240 purposively selected maize crop farmers was conducted in twelve farming communities in the Oyo region of southwest Nigeria. The study showed that indigenous knowledge of climatic conditions such as the migration and chirping of the Elulu bird (2.5%); intense heat and changing temperature usually after harmattan and before onset (14.6%); observation of cloud movement (42.9%) while the following indicate the onset of the dry season: flowering of some plants and trees: Ficus capensis and Tallow plant (11.3%), dew fall (8.8%), flying of eagles in the sky (2.5%). In adapting to climate change, maize crop farmers adopted no strategy (49.6%), prayers (2.9%) the change of planting dates (39.2%), planting of crops on flood plain (1.7%), irrigation (1.3%), chemicals and processing of maize seeds (1.7%) among others. Based on the foregoing, the study strongly advocates for the incorporation of indigenous knowledge into formal climate change adaptation and mitigation.

SE-04-11

Climate-change induced migration in the semi-arid South Eastern Zimbabwe: patterns and effects on rural livelihoods

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Climate change is expected to bring about significant changes in migration patterns in the developing world. The increases in incidences of extreme events that impact negatively on rural livelihoods is believed to constitute the push factors that trigger population movement. Migration as a response to climate change could be seen as a failure of in situ adaptation methods, or could be alternatively perceived as a rational component of creative adaptation to environmental risk. This study discusses local reactions and adaptations to short and medium term climate change. Using data from a survey on randomly selected 252 households, focus group discussions and key informant interviews, the paper examines the nature, character and effects of climate change in the region that create a migration gradient. It further interrogates the patterns of out-migration and the effects the process has had on the livelihoods of the people in the South Eastern parts of the country. It was found that migration decisions depend on the household's resource endowment with the majority of actual emigrants (70%) being male who regard themselves as poor. The findings also highlight the role of remittance income in livelihood enhancement and response to climate-induced disasters. It also emerged that cyclical migration is part of the

solution to the effects of climate risks and an important household strategy for risk reduction. As such, there is need to understand migration patterns and their differential implications on women, man and communities. Given that some members of the household pursue migration as a result of adverse climatic events, government policies and strategies are required to promote diversified adaptation options in the source regions. With great realisation of the role of migration in economic development and livelihood progress, there is need to alleviate risks at destination regions as well as creating opportunities for trapped populations.

SE-04-12

Utopia Thinking And The Imaging Of Green Eco-Friendly Cities In Sub Sahara Africa

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The face of cities in Africa is constantly changing from a juxtaposition of order and disorder, ugly and beautiful, pleasure and pain, productive and unproductive, consumption and waste. Contemporary cities must be fit, flexible and functional to relevantly integrate the negative effects of climate change, migration, sprawl, chaos and disorder. Imaging the future of these cities through the renewed lens of utopian thinking will no doubt make for resilient, peaceful and harmonious environment for the burgeoning populations that now reside in cities. The paper examines Utopia thinking in some selected cities and its implications as a tool to re-invent the future of contemporary cities in sub Sahara Africa. Based on literature review, the paper brought to fore the images and anecdotal evidences of plethora of utopias, especially the emerging multiple utopias such as sustainable Utopia (green or eco-friendly, carbon neutral cities) and technological in city planning in sub Sahara Africa. It recommends covert integration of the utopian ideas of new urbanism into city planning to restore the disturbed ecological component of cities

Tuesday 24th Presentations

SE-05
Urban Landscapes

SE-05-13

Urban Expansion, Wetland Resources Depletion and Population Changes: A Geo-Spatial Assessment of Lekki – Ajah Coastal Zone, Lagos, Nigeria

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The study assessed the effects of increasing population on depletion of wetlands around the Lekki-Ajah area of Lagos Nigeria. It established the population sizes, area extent of the natural resources and the per capita distribution over the periods of 1966, 1994 and 2006 comparatively. Remotely sensed images of the region were integrated with the maps and census data for spatio-temporal analysis within the ArcView Geographic Information System (GIS) environment. The results showed that fully built-up areas increased from 97.72 ha (representing 0.11%) of the total landcover and landuses of the area in 1966 to 1,160.16ha (1.25%) in 1994 and 4,010.00ha (4.32%) in 2006, scattered development grew from 0ha (0%) to 1,151ha (1.24%) and 8,544.0ha (9.21%) respectively over the periods. Waterbodies also rose from 45,413.60ha (48.95%) to 45,960.25ha (49.52%) and 45,999.22ha (49.57%); all at the expense of forested wetlands primarily but also palms and farmlands. Population of the area increased from 14,815 in 1966 to 34,122 in 1994 and 44,031in 2006 giving an average density of 15.97pp/km², 36.77pp/km² and 47.45pp/km²; per capita wetlands distribution of 0.77ha, 0.45ha and 0.18ha respectively. These imply that the wetlands are under pressure and that the carrying capacity is also under threat continuously. The implication for sustainable development is discussed ranging from unplanned development, growth of urban slums, worsened living conditions and potentials for environmental hazard risks.

SE-05-14

Greenhouse gas reduction pathways in urban sectors focusing on food waste in hospitality industry in Kenya

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Agricultural systems account for about 10% of global greenhouse gas emissions which significantly contribute to climate change. Large quantities of food produced are discarded at consumer level such as in the hospitality industry in many urban areas. Thus, reducing the amount of food waste remains an important aspect in promoting sustainable urban development. In addition to examining emerging consumer trends and their contribution to food wastage, this study aimed to determine the sources of food waste, and examine the barriers to and opportunities for reducing the consequent greenhouse gas emissions within the hospitality industry in Kenya. Data was obtained from six randomly selected hotels within Nairobi city by focus group discussions, key-informant interviews, direct

observations and measurements of food waste. The amount of food that was regarded as waste was categorized as either having originated from the kitchen or having been caused by the consumer. Total wastage averaged 54% from the kitchen and 46% by the consumer. Only 33% of the interviewed (n=60) members of staff had some knowledge about the impact of food waste, while 80% of the facilities (n=30) approached dismissed the study as unnecessary. This analysis indicates inadequate information about food waste, which contributes to the lack of deliberate efforts in implementing sustainable food practices in hospitality sector. The study recommends education and training of staff and creating awareness among consumers on reduction and management of food waste. Further efforts, which will require more research, are therefore needed to integrate sector-specific climate change mitigation measures in urban areas.

SE-05-15

Flood Disaster-Induced Residential Mobility In Ibadan, Nigeria

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Global warming and climate change are some of the greatest threat to life on earth. It has been acknowledged that human activities are major drivers of global warming and climate change. For example, buildings use large amount of power and released between 10 and 30 tons of carbon dioxides, a potent Green House Gas (GHG) annually. It is estimated that average global temperatures will increase by 1.80C to 40C if GHG emissions remain unchecked. This will facilitate more environmental disasters such as hurricane, wildfire, heat wave, drought and flooding. This paper examined the impact of flood disasters on residential mobility in Ibadan. Vulnerability theory provided the framework while cross-sectional survey design was adopted. Multi-stage sampling technique was used to select household heads from 1,135 residential buildings (50%) out of the 2,270 buildings affected by the 2011 and 2012 floods. Fifty-six per cent households experienced housing mobility and 207 (7.4%) devastated buildings were abandoned with Ibadan South West Local Government Area recording the highest percentage (23%). Also, 621 households and 3,726 persons were permanently displaced from their homes. There is a positive relationship between intensity of flood and rate of building abandonment (r= 0.673). Green housing design and construction are relevant solutions to flood disaster-induced residential mobility in the city. Also, strategies that focus on flood risk reduction and climate change present a unique opportunity to engage different stakeholders in providing inclusive and sustainable development agenda for Ibadan.

SE-05-16

Impact of Urbanization on Climate Change and the Inhabitants of Benin City, Nigeria

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One of the major factors globally accepted to have impacted on climate and climate change is urbanization. Since the sizes, growth rate, human activities and cross boundary

issues in each city vary, the degree of contribution of the city to climate change and the impact of such change on the inhabitants of the city could also vary temporarily and spatially within the city. This study therefore investigated the impact of urbanization on the climate of Benin City, Nigeria and how the inhabitants have been responding to the climatic changes. Growth rate of Benin City between 1987 and 2017 was analysed using Geospatial techniques. Mean monthly and annual climatic data (Temperature and Rainfall) of Benin City for 60 years (1957- 2016) were analysed. The spatial cross-boundary weather variation (Temperature and Relative Humidity) within Benin City (2015- 2017) was collected from 31 sites using traverse method. The impacts of climate change and adaptation measures were also investigated by administering 500 copies of a questionnaire in low, medium and high population density of the city. The data were analysed using Cartographic and statistical techniques. The results show that Benin City grew from 220Km² (1987) to 406Km² (2017) due to economic growth, increasing educational institutions, and administration etc. Increasing temperature and rainfall is experienced and while temperatures of the Central Business District of Benin City were higher than the suburb by 8.8OC, relative humidity was lower by 14%. The observed impacts are; increasing temperature (1.3OC) and rainfall (63mm), increase in flooding and gully erosion incidence, heat related ailments, among others. To avoid the future we do not want, the inhabitants employed mitigation and adaptation measures like; use of temperature modifying gadgets, energy saving bubs, urban greenery, change in building materials etc. Adherence to physiologically sustainable urban climate adaptation policies is recommended.

SE-06
Extreme Events

SE-06-17

How will Climate departure influence future changes in crop suitability over West Africa?

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Climate departure, an unprecedented future warming, is projected will have direct consequences on food security. West Africa, whose livelihood is driven by rainfed agriculture and has suffered significantly from climate change impacts has been identified as one of the hotspot regions to experience climate departure. However, how this will influence crop suitability and affect the declining agricultural sector and the need to improve food security is of great concern to the inhabitants and policymakers. The aim of this study is to examine how climate departure will affect crop suitability in the future over West Africa. Climate data from three stations in the three Agro-Ecological Zones (AEZs) of West Africa from 1960-2100 were used. The future climate was downscaled from 4 CMIP5 GCMs, CCMA, CNRM5, GFDL and MIROC and used as input into the crop suitability model, EcoCrop. The result showed good agreement between observation and the models\' simulation of total monthly precipitation and mean monthly temperature across the AEZs with correlation value, r ≥ 0.5 except over Guinea zone with low value (r=0.2) for total monthly rainfall. Our finding projects future warming will lead to shifting in crop

suitability to non-suitability (e.g. Cassava, Plantain and Pineapple) in the Guinea and Savanna zones and non-suitable to suitable in the Sahel zone (e.g. Maize) by the end of the century. Mango is projected will remain suitable across the three AEZs of West Africa. Thus, climate departure is projected will lead to shifting in crop suitability across AEZs over the region. The study will help inform policymakers of the impact on climate departure on crop suitability over the region. It will also assist them in making an informed decision about adaptation measures to ensure maximum yield and improve food security in the future in a changing climate over West Africa.

SE-06-18

A spatially varying coefficient zero-inflated Poisson modelling of cholera incidences

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Cholera vibros are part of the natural aquatic flora; hence eradication from the environment is almost unfeasible. Development of model-based risk maps of cholera can help optimize scarce resources for Water, Sanitation, and Hygiene (WaSH) and vaccination programs during outbreaks. Cholera outbreak data presents a unique challenge as many reporting spatial units report zero cases or under-report. The use of traditional mapping methods may lead to either over-estimation or under-estimation of risk, and thus may suggest spurious results. Also, including climatic and demographic variables like land surface temperature (LST), precipitation and urbanization have high potential to enhance risk estimation. However, the impact of these may change across space and if ignored may cause wrong interpretation. In this study, we develop a zero-inflated spatially varying coefficient Poisson-model that account for both the excess zeros, heterogeneity due to underreporting, and non-stationary covariate effects. We apply our model to the 2014 cholera outbreak in Ghana. Model comparison using the Deviance Information Criterion (DIC) indicated our model outperforms the traditional spatial Poisson models. The overall risk of cholera was 1.36 per 1000 people. The multiplicative effects of the risk variables were 0.9, 1.14, and 0.99 for precipitation, LST, and urbanization, respectively. Thus, unit increases in precipitation and urbanization reduce cholera by 10% and 1% receptively, while that of LST increases cholera by 14%. There were remarkable spatially varying local departures, suggesting, for instance, a unit increase in urbanization rather increase the risk by 1% within some districts. We conclude that (1) LST, precipitation, and urbanization are important predictors of cholera, and (2) model-based mapping of cholera risk using spatially varying zero-inflated Poisson model is effective for elucidating risk factors.

SE-06-19

The Impact of Precipitation Effectiveness Indices And Agricultural Planning In Northern Part Of Bauchi State-Nigeria.

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This study examines the impact of precipitation effectiveness indices and agricultural planning in the northern part of Bauchi state, Nigeria. Climatic data were collected for 23 stations distributed all over the study area for the period 1999-2017.The data was subjected to various agro-climatologic and statistical analyses that included the computation of onset, cessation, and length of rainy season, dry spells, hydrologic ratio and seasonality index. Results indicated that expected dates of onset of rains vary from 2nd May to 30th May in the study area. Mean cessation dates ranges from 6th September to 4th October while the length of rainy season ranges from 102 days to 185 days. The study area was found to be highly prone to dry spells and diminution in soil moisture at critical periods. Both hydrologic ratio and seasonality index manifest the high level of water deficit in the study area and the need for the development of small and large dams for supplementary water. It provides a base line data and maps for grass root agricultural planning in the study area.

SE-06-20

The rational approach for citizens of Khartoum to adapt and cope with the extreme events in the context of climate Change

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Sudan is particularly concerned with impacts of climate change. Sudan is one of the most vulnerable countries in Africa. The majority of its land is quite sensitive to changes in temperature and precipitation with a fragile ecosystem and weak infrastructure and economy. More than 70% of Sudan population is directly dependent on climate-sensitive resources for their livelihood. The country's economy like many developing countries is dependent on agriculture where the fact that agriculture and the associated industries although not yet fully modernized are the major employment sectors in the Country. The dependency of the majority of farmers on rain fed agriculture and pastures has made the economy extremely vulnerable to the vagaries of weather. As a result, failure of rains and occurrence of drought during any growing seasons may lead to severe food shortages/ loss of animals if there is lack of strategic planning and suitable adaptation options. Climate plays a key role in social- economic activities. The understanding of climatic conditions such as the occurrence of climatic extremes would benefit in early warning programs and mitigation procedures for food security. Khartoum State since 2010 witnessed several flash floods from torrential rains and the most affected vulnerable groups are the displaced that dwelled in the marginal areas around Khartoum. The government has done its best and planned most of those areas and extended infrastructure services. Some of the new settlements blocked the natural drainage system of rain. Since 1980s, the occurrences of the extreme climate events became frequent;

besides the floods that occur normally during mid July-mid September. The solutions has taken place through water harvesting and new planning to the marginal areas in addition to the new paved roads but still some challenges stand around. There are large extensions in Khartoum State, where the population from 5 million in 1999 expanded to more than 9 million. The local communities with emphasis on NGOs and private sector in addition to the government support could play strong participation in public awareness and implementation of national projects. The excess water of torrential rains could be utilized in agriculture (vegetables, animals) forest greenbelt and gardens around Khartoum State. Eventually extreme climatic conditions have been around time in memorial and are here to stay.

SE-07
Complex Systems

SE-07-21

Reclassification of Agroecological Zones for Parkland vegetation: An Assessment of Climate Change Impact in Nigeria

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Agroecological zonation (AEZ) is driven largely by climate and therefore as climate changes, agroecological distribution is also likely to shift. Predicting changes in AEZ offers the potential to identify homologous environments and to help settled people adapt to future conditions. Despite this, forward-looking research into adaptation of farming systems has been minimal. In this paper, we describe the possible spatial changes to AEZs in Nigeria as affected by climate factors under current and future (2050 and 2070) climates. Climate data from ground stations and worldclim were interpolated to generate a grid of 19 bioclimatic variables at 774 occurrence locations. Random forest classification was used to model and calibrate the spatial distribution of existing AEZ classes onto these climate data layers. Results showed high agreement (91.2%) between our model and current AEZ classification. Temperature and precipitation seasonality variables were the primary drivers of AEZ distribution. The model was then used to derive AEZ distribution using predicted 2050 and 2070 bioclimatic variables to evaluate how AEZ locations shift as climate changes. The year 2050 predictions highlighted a gradual southwards migration of current AEZs thereby shifting locations currently classed as Sudan Savannah to Northern Guinea Savannah and the Northern Guinea Savannah to Southern Guinea Savannah. By 2070, the Derived Savannah is significantly more drought threatened, as Southern Guinea, savannah and Mid-Altitude is likely to replace large areas of Humid forest and Derived Savannah, respectively. These changes are likely to have impacts on livelihoods of local populations. Research should focus on more southerly AEZs adopting germplasms and practices from more northerly AEZs, while the drier AEZs will need to shift to more drought-resistant trees species. This will improve long-term sustainability of rural livelihoods and reducing rural-urban migration.

SE-07-22

Assessing the climatic impact on the Owabi hydrological basin in Ashanti region, Ghana

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The Owabi catchment which is about 69 km² provides about 20 % of water needs of the Kumasi metropolis has been in recent times prone to high anthropogenic activities that threaten water resource management. The Soil-Water-Assessment-Tool (SWAT) was used to assess the hydro-climatic variability resulting from these activities on the catchment from 1986 to 2015. The study also used one gauged catchment with the spatial proximity global arithmetic mean method to transfer stream-flow data to the ungauged Owabi catchment. This technique was tested using the results of the statistical indices obtained during calibration. Specifically, the model simulated historic and projected stream-flow and water balance. Initial results revealed the forest and topography played a major role in water loss at the catchment as evapotranspiration and surface runoff were the dominant modulating processes. Monthly calibration/validation of the model yielded acceptable results with NSE (0.58/0.62), R^2 (0.65/0.67), PBIAS (20.5%/19.8%) and RSR (0.65/0.62). Three sensitive parameters of which the catchment slope (CN2) ranked principal were found to control runoff amounts into the river. Uncertainty was also quite low as the model enveloped about 50% of the observed stream-flow within a width of 0.58 - 0.69. The satisfactory performance of the model in the ungauged Owabi catchment gives a direct indication of the performance of the regionalisation scheme. Future stream-flow predictions (2021 - 2050) which were modelled for three climate ensembles under RCP2.6, RCP4.5 and RCP8.5 climatic scenarios, and two land-use scenarios (land-use category 1 and 2) showed a decreasing trend in rainfall totals which is directly translated to generated catchment stream-flow amounts. The decrease in rainfall and stream-flow generation would negatively impact the amount of water produced by the water processing plant at Owabi, which implies a higher dependency on the neighbouring Barekese dam to meet future demands of water for the Kumasi metropolis.

SE-07-23

Regime shift and interplay: towards more robust social-ecological systems

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Regime shift is defined as large, abrupt and persistent change in structure and functions of ecosystems or shift of a system from one basin of attraction to another upon surpassing tipping points. Systems be it natural or modified by human being are associated with certain values that significantly influence inherent complex interactions within them. In the human dominated era, also termed as the Anthropocene, unwanted regime shifts are on the rise, negating human well being in terms of food provision, health and livelihood options to cite a few. There are trade-offs involved from one shift to another, including replacement of woodlands which initially provided fuel source to more economic regimes of ecotourism in this case study, Amakhala game reserve in the Eastern Cape province of

South Africa. Livestock farmers have gradually converted their farmlands to game farms, a shift that has brought mixed reactions between communities and landowners, but most importantly have traded off a range of ecosystem services of cheaper and comfortable life to more carbon stock regimes, seen by ecologist in the region as conservation of biodiversity. This interplay presents scenarios which can be leveraged, one being building stronger resilience of the social-ecological system and contextualizing such efforts.

SE-07-24

Implications of climate change induced schistosomiasis burden on gender and family structures in determining risk and vulnerability: A case study of Ntalale ward, Zimbabwe.

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Climate change is altering spatial distribution and epidemiology of schistosomiasis and will continue in the future. Schistosomiasis is a snail-borne parasitic disease endemic in Zimbabwe with serious health and social impacts, yet responses are dominantly medical interventions. This paper describes how family structure and gender inequality may predispose families to schistosomiasis risk and vulnerability. Focus group discussions and interviews with men and women were conducted separately in order to determine the influence of gender inequality to schistosomiasis risk and vulnerability in the context of climate change. Community members were aware of climate change and had experienced increasing temperatures, decreasing rainfall, heat waves and floods. Participants had different opinions on the influence of climate change schistosomiasis prevalence. Community perceived trends showed that schistosomiasis was increasing and so was temperature while rainfall was decreasing. Men were at higher risk of contracting schistosomiasis as they were engaged in productive activities that involved contact with water and hence fuelling transmission of the disease. The productive and reproductive activities which female family heads participated in predisposed them to schistosomiasis. The patriarchal system embedded in the extended family structure and declining income from agricultural production were important factors in limiting access to health for members under female-headed households. Climate change, rural political economy transformations and patriarchal culture were perceived to contribute towards deepening the burden of schistosomiasis in Ntalale ward.

SE-08
Adaptive Strategies and Climate Services

SE-08-25

Choice of Climate Change Adaptation Strategies under Various Land Tenure Systems

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Climate change and variability has become a major global developmental issue which affect all aspects of human lives. African farmers are said to be one of the most vulnerable groups to climate change. In order to mitigate the negative impact of climate change and variability, farmers adapt using various strategies. During adaptation, land plays a key role and needs explicit consideration when studying the strategies farmers use to adapt to climate change. This study sought to determine the effect land tenure security held by a maize farmer had on the choice of climate change and variability adaptation strategy. Various means by which land is acquired and the land tenure systems held by farmers were identified. The land tenure securities associated with these lands were assessed. In identifying the adaptation strategies used, farmers were first asked factors which drove them into changing their farming practices. Farmers did not only adapt due to climate change but also due to a rise in the demand for certain crops, new economic activity in their communities and others. Adaptation strategies of farmers who responded to adapt mainly due to climate change and variability were identified. Crop diversification was found to be the most used strategy and irrigation being the least used strategy. Other strategies identified were the use of new variety, chemical and fertilizer use, addition of livestock, shifting cultivation, mulching, relocation of farm and diversifying into new economic activity. Age, sex, household size, yield, access to credit, type of major economic activity, basic education and district were found to statistically affect the choice of adaptation strategy. No Security significantly affected the choice of fertilizer and chemical use as well as addition of livestock to farming practices. It however increased the chance of relocating farm. Moderate Security increases the probability of choosing new economic activity but reduces the chance of adopting new variety, fertilizer and chemical use and addition of livestock. Maximum Security increased the chance of shifting cultivation but reduced the probability of diversifying into new economic activity and addition of livestock raring to livelihood sources. From the study it can be concluded that Leasehold and No Security were the most common land tenure system and land tenure security respectively. Climate change and variability was not the only factor that drove farmers to change farming practices. The land tenure securities estimated in the study had an effect on farmers' choice of adaptation strategy to climate change and variability. It is however recommended that farmers' information sources must be enhanced in order to educate farmers on various adaptation strategies to climate change and variability. Ministry of Food and Agriculture and Ghana Irrigation Development Authority should consider partnering private firms to set up an irrigation system along the Afram River to provide supplementary water source to the rains. Civil Society organizations and N.G.O. can also strengthen farmers' land tenure security by the establishment of land banks and proper documentation of land contracts.

SE-08-26

Indigenous flood management mechanisms in Ibadan, Nigeria

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Climate change is aggravating the vulnerability of human settlements to natural and human-made hazards globally in both the coastal and inland communities. Climate change and urban concentrations increase flood hazard. More than a half of the world's population in cities, the majority of whom are poor, lives in flood-prone areas. The literature shows emphasis on empirical geophysical knowledge and technical systems as the most effective flood-control mechanisms, ignoring local knowledge and practices of local communities. This study, therefore, investigated indigenous practices used by the residents of Ibadan to manage incessant flood. Cross-sectional research design was adopted. Both primary and secondary data were collected. Two urban (Ibadan North and North East) and two sub-urban (Iddo and Ona-Ara) Local Government Areas (LGAs) were purposively selected for the study owing to the severity of the August 26, 2011 flood disaster in these areas. A structured questionnaire was administered to 925 household heads (47.2%) randomly selected from the 1,961 houses that were severely affected by the flood. Four focus group discussion sessions were also conducted. The indigenous flood management practices adopted by the respondents were traditional forecasting-(23.9%) and early warning systems (21.1%); sacrifice to gods (15.6%); construction of drains (13.3%) and embankment (9.4%); tree planting (11.2%); and use of sandbags (5.5%). The respondents considered the practices affordable (89.3%), effective (81.4%), reliable (78.5%) and sustainable (69.5%). As a way of closing knowledge gaps, indigenous flood management approaches should be considered as complementary to conventional measures for flood management in Ibadan. A policy review by decision-makers and planners on flood risk reduction should integrate indigenous flood risk mechanisms into the existing frameworks.

SE-08-27

Enhancing Climate-Smart Agriculture in Northern Ghana through Ecosystem-Friendly Farm Practices: Insights from Irrigation Scheme-Types

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The farming practices employed by farmers vary among irrigation schemes in northern Ghana and these practices have an effect on the biological functioning of the agroecosystems and largely the climate pattern. To enhance a climate-smart agriculture, healthy agroecosystems are imperative and essential for balancing agricultural output and nutrition. However, the plethora of studies in Ghana on climate-smart agriculture have paid little attention to the valuation of services provided by the ecosystem-based farm management practices (EBFMPs) adopted by farmers. Also, irrigation landscapes provide a range of services useful in sustaining many livelihoods and yet, the attention given to the various irrigation scheme-types is uneven. The paper thus examined the EBFMPs that

exist in both community and government managed irrigation schemes. It further estimated and analysed the willingness to pay values of farmers for EBFMPs sustainability. The study employed mixed methods – qualitative and quantitative techniques. Data were collected through key informant interviews, focus group discussions and a semi-structured questionnaire administered to 300 households. The contingent valuation method and descriptive statistics (mean comparison and chi-square tests) were employed to analyse the data. Eight (8) EBMFPs were examined which are compost application, conservative tilling, conservation of vegetation, mulching, crop rotation, intercropping with legumes, efficient drainage systems and bunding. Though farmers under community managed irrigation schemes (CIS) are older in age with low formal education and earn less income from irrigation farms, they were more willing to pay and at a higher value for EBFMPs sustainability than those under government managed irrigation schemes (GIS), and this is significant ($P<0.01$). For agriculture to be more sustainable and ecologically friendly in Ghana, then equal attention should be given to community-based irrigation schemes, which are relatively sustainable in food production.

SE-08-28

Climate Change: Towards Improved Water Availability for Rural Development in Zimbabwe

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Of the 11 million Zimbabweans who live in rural areas 8million are females and 32% of them have no access to potable water in violation of SDGs 1 and 6 and Cluster 1 goals of the Zimbabwe Agenda for Sustainable Economic Transformation. El Nino causes drying of water bodies, most of which are silted; in the 1991/92 agriculture season, drought reduced production of maize by 83%, cotton by 72%, sugar cane by 61% and national herd by +23%. In the 1st quarter of 2016, 54% of households had their regular water sources dry and crop failure forced thousands of households to become net food buyers amidst grain price hike of 60% in 2016 and 70% in 2017 respectively. Community-led water harvesting and greening projects are essential; planting 4 trees/year by the rural residents translates into about 52 million/trees/year which will provide food, timber, medicine, beauty, oxygen, prevent soil erosion, revitalise the ecosystem and create millions of jobs and livelihoods in the country. Construction of solar plants and mini hydro power stations would provide clean energy to power rural homes, schools, clinics and boreholes. Millions of rural girls will have more time to do school work. If the 7 million Zimbabweans in the diaspora contributes towards diaspora water related investment projects, fisheries, irrigations and rural ecotourism will enhance rural incomes making it easier to turn the Zimbabwe we do not want into the Zimbabwe we want. US$10.3 million has been set aside by Government for drilling and rehabilitation of 5 600 boreholes, 12 piped water schemes and sanitation programmes in 12 districts which rank low in terms of water supply. Zimbabwe Environmental Lawyers Association (ZELA) is mounting community-based workshops on environment management; over 4 000 locals attend these workshops yearly. However, ZELA does not have arresting powers. Instead of being policed by outsiders, locals should take full responsibility of their areas. Use of mobile phones to disseminate area-specific

information is advisable given that 87% of rural residents own mobile phones. However, the cost of data bundles is too high at U$1/250MB.

Wednesday 25th Presentations

SE-09
Deltas, Climate Change and Migration

Globally deltas are home to about 500 million people.. However, it is estimated that by the year 2050, a minimum of 1 million people will be displaced by current sea-level trends within these deltas. Inhabitants of deltas experience multiple hazards namely coastal erosion, flooding, drought and salinization. The Volta Delta for instance, is an area of intense economic activity including commercial agriculture and the exploitation of resources such as salt. Threats of habitat fragmentation, unplanned human settlement, salt water intrusion, siltation and destruction of mangroves are the key challenges in the Delta catchment. The DECCMA project has as its main aim to evaluate the effectiveness of adaptation options and to assess migration as an adaptation option in deltaic environments under a changing climate. This is in order to deliver policy support to create the conditions for sustainable gender-sensitive adaptation. To achieve these, key stakeholders within the Volta delta have been engaged at the community, district and national levels. A household survey on migration and adaptation as well as biophysical assessment and socioeconomic analysis have been conducted through the project. This session will discuss the biophysical and socio-ecological evolution of the Volta Delta defined by the 5m contour, taking into consideration governance and policy response to environmental challenges. It will focus on the interactions between biophysical processes and anthropogenic activities in the delta. The session will further discuss findings on adaptation practices and migration patterns of populations in response to the biophysical and socio-ecological changes in the Volta Delta. We intend to bring together key actors from academia, civil society, national government and the media. The discussions will focus on sharing experiences and findings from the research project to inform policy and similar future research endeavours.

SE-10
Bridging Gaps between Research and Practice

SE-10-29

Climate Change, Pollution, And Economic Growth: An Autoregressive Distributed Lagged Model (Ardl) Approach

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The largest single threat to the ecology and biodiversity of the planet in the decades to come will be global climate disruption due to the buildup of human-generated greenhouse gases in the atmosphere. People around the world are beginning to address the problem by reducing their carbon footprint through less consumption and better technology. Climate change and pollution are closely linked, which in the long run affects economic growth. How these variables affect economic growth are some of the questions the study intends to answer. In this study, economic growth was proxied by the Real Gross Domestic product (Real GDP) for Nigeria, pollution was measured using Carbon

Emissions (CO_2 per capita). CO_2 contribute over 70% of the total emission to Green House Gases, and climate change was measured using mean average rainfall. Data covered a period of 1980-2017 and was obtained from World Development Indicator. To study the basic interlink between climate change, pollution and economic growth, a standard Ramsey–Cass–Koopmans growth model and the environmental Kuznets curve (EKC) hypotheses is explored, in which a social planner maximizes the utility of identical consumers based on an intertemporal optimization problem. The estimation technique used is the Autoregressive distributed lagged (ARDL) and bond-testing estimation approach. It is expected that climate change will have a negative effect on economic growth, and pollution is expected to have an inverse relationship with economic growth in Nigeria. The study, therefore, recommends that the protection of forests is essential for reducing emissions from deforestation. Africa's rainforests, especially the Nigerian rainforest make a major contribution to protecting the global climate. The contribution of the rainforests to climate protection is a global public good.

SE-10-30

Impact of the MJO on tropical precipitation

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Forecasting at subseasonal timescales has not received much attention despite the considerable socioeconomic benefits that could be derived from these forecasts. This is due to the difficulty associated with this time range. Resent research has identified the MJO among others as one important potential source of predictability at this timescale. A better understanding of the MJO and its influence on the prediction at this timescale is therefore crucial for reaping the enormous socioeconomic benefits. The impact of the Madden-Julian oscillation (MJO) on tropical rainfall has been examined for different regions of interest in the tropics. Using rainfall data from TRMM and Real-Time Outgoing Longwave Radiation Multivariate MJO index (ROMI) for the period 2002 - 2016, the response of the weekly rainfall anomaly to the different phases of the MJO was accessed for the Maritime continent, West Africa, Central Africa, East Africa, the Pacific and South America. The significance of the MJO signal in a 10 year (2006 - 2016) rainfall data of each of the regions was first accessed using wavelet analysis. Significant MJO signals were found in the Maritime Continent, the Pacific, West Africa, Central Africa, South America and Northern South America, the strongest signal being in the Maritime continent. The weakest signals were found in East Africa and the Southern South America. Assessing the response of the weekly rainfall anomaly to the MJO strength for the combined phases as indicated by the Wheeler - Hendon RMM index, Phases 1 & 8 and 2 & 3, which are associated with higher MJO strengths, resulted in convection over West and Central Africa, South America and East Pacific. Phases 4 & 5 and 6 & 7 which are associated with a relatively lower MJO strength resulted in convection over the Maritime continent and Northern West Pacific. Convection in East Africa was associated with phases 2 & 3 and 4 & 5 although the signal was relatively weak while convection over the entire Pacific, the West Pacific and the Southern West pacific are associated with phases 1 & 8 and 6 & 7. For the response of the weekly rainfall anomaly to individual phases, the Maritime continent interestingly has its highest weekly rainfall anomaly (convection)

associated with phase 6 (which was not revealed using the combined phases in the Wheeler – Hendon RMM index). The results of the weekly rainfall anomaly to individual MJO phases has therefore revealed significant signals from other phases on different regions which were not considered earlier. Based on these results, the authors propose a new approach to combining MJO phases for the various regions of study. These results are significant for enhancing our understanding of the MJO for subseasonal prediction.

SE-10-31

The relevance of climate finance flow on agriculture production in Ghana.

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Climate finance has become an important component for dealing with anthropogenic (human-induced) climate change globally. Though the discourse on climate finance is fairly a new area of concentration for most climate researchers, evidence shows that the inability of many developing countries to undertake and roll out climate-relevant policies can be tied to the unavailability of effective climate finance policy initiatives. The United Nations Framework Convention on Climate Change (UNFCCC) have developed several mechanisms to support developing countries to finance climate change activities. Among such mechanisms includes the $100 billion per year to be provided by the developed countries by 2025, the adaptation fund (AF) as well as the Forest Carbon Partnership Facility (FCPF). The Adaptation Fund, for instance, will assist developing countries to mobilize resources to build climate resilient in critical sectors of the economy to include sectors such as the transport, forestry and agriculture. Ghana has demonstrated a strong commitment to tackling global climate change. Particularly, the country has been active in many international climate change negotiations and have recently presented its 4th Nationally Determined Contributions (NDCs) ahead of the recently organised Paris climate change conference under the tutelage of the UNFCCC. The National Climate Change Policy (NCCP) was also launched in 2014 to give policy direction on how the country intends to achieve its climate change objectives. Domestic policy considerations continue to be slow while little effort has been made to mobilise domestic resources to tackle anthropogenic climate change. The outcome of this research shows that the agriculture sector over the years has received little attention in climate-relevant budgetary allocations. Climate-relevant budgetary allocation for the agriculture sector also shows that the ministry of food and agriculture has spent far less than what has been allocated to it. This research work adopted secondary data analysis of the situation to include 10 selected sectors of the economy based on a 4-year period. The agricultural sector for the 4year periods (2011-2014) accounts for 6% of total climate finance flow while the forestry sector received 35%. The total percentage of finance flow into the agriculture sector may be more than accounted for because the REDD+ projects, the National Agriculture and Food Security Action Plan and the Ghana Cocoa Sector Development Strategy (CSDS) all received separate finance flow. Out of the 6 sources of Ghana's climate finance flow for the selected 10 sectors, bilateral flow constitutes 50% of the total climate finance while multilateral flow constitutes 39%, national funds constituted 5%, the Global Environment Fund (GEF) was 3% while co-finance and external private foundations constituted 2% and 1% respectively. For the NCCP policy, mitigation policy initiatives constituted 90%, the

means of implementation and adaption constitute 8% and 2% respectively. The study adopted a qualitative content analysis to show that the country's largest sources of climate finance flow comes from bilateral flows and this includes sources such as official development Assistance (ODA) from the developed world. Despite this significant climate finance flow, institutional fragmentation continues to hinder the effective use of climate finance, particularly for climate-related activities in the country. The outcome of the study also shows that there is an important link between economic policy considerations and the consideration for climate-relevant policy decisions by governments. Participants will be taken through the research focus areas to include the observed 4-year period following the launching of the NCCP. Some of the research recommendations such as institutional and climate policy alignments, mobilizing climate finance from local assemblies and budgetary considerations for climate-relevant activities will help participants draw lessons from what has been done in other jurisdictions, taking into consideration cases from the Amazon Fund and the Indonesian Climate Change Trust Fund.

SE-10-32

GIS Based Carbon Sequestration Estimation in Buska Mountains Forest: (Exemplary Adaptation and Mitigation Experience) in Southern Ethiopia

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Indigenous community forests are generally considered to be a major carbon sink, but deforestation and forest degradation lead to large releases of biomass carbon. The concentrations of CO_2 and other greenhouse gases in the atmosphere have been increasing and greatly affecting global climate and socio-economic systems. It is challenging to accurately estimate the spatial distribution of above ground forest biomass carbon (AFBC) across large areas because of the spatial heterogeneity of forest cover types and canopy structure. Estimating the carbon sequestration potential of indigenous forest resources are relevant to support the local community and contributes towards sustainable development by reducing emission from deforestation and/or also through absorbing the green house gases via the process of photosynthesis. The study area is located in South Omo Zone in Hamer wereda in the south western Ethiopia. The approach highlighted use of GIS to develop carbon database, perform spatial analysis and map average annual carbon stock and it was applied to a case of Buska Forest area for quantifying and mapping the amount of above ground forest carbon sink (AFCS) and forest carbon stock (FCS). The methodology provides a consistent, practical, and relatively inexpensive way for estimating AFBC at 30-m resolution over large area in Hamer wereda. The forest boundary map is developed by using satellite imageries, topographic maps and GPS points collected from the field. Based on elevation the forest area is stratified in to three stratums namely lower, mid and higher altitude strata's and Forest Inventory and Analysis (FIA) data, AFBC were calculated from 673 field plots in accordance to the intergovernmental panel on climate change IPCC Good Practice Guideline. Accordingly, by integrating forest inventory data into Arch, GIS Software, biomass data were employed to quantify the above ground forest carbon sequestration AFCS and FCS, The final dataset represented 4 major forest cover types for a 4,019 ha forested area. About 84 forest tree specious were identified within the three stratums. Despite emerging

deforestation challenges the findings indicates that Buska Mountain Forest has the potential to sequester 1,315.419 ton/ha/year on average and the mean carbon stock is about 327.3 ton/ha. Therefore, the indigenous biodiversity and forest governance culture of the community has significantly contributed towards mitigation and adaptation to climate change. Identifying major drivers of deforestation and forest degradation will be very helpful to address the adverse effects of climate change.

SE-11
Technological Assessments

SE-11-33

"Exploring the boundaries of sustainable service delivery model in the adoption of solar PV solutions in informal settlements: Case studies from South Africa and Ghana"

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The paper closely examined the adoption of solar PV in informal settlements in two distinct, yet complementary case studies in South Africa and Ghana. One case study offers a sustainable enterprise approach which involves continual modifications and adjustments of the operational infrastructure, premised on enterprise discipline, cost-recovery and financial sustainability principles. This enterprise model prioritizes the relationship between the service provider and the client. The other case study has a community-focused approach with a highly socially configured infrastructure, premised on community mobilization, savings groups, partnerships, affiliations, and coalitions. This second model places less emphasis on operational systems and enterprise capacity. The key highlights of the paper examined the scope for non-profit 'public-private-partnerships' in the delivery of interim services; balancing financial sustainability with maximizing broader economic impacts beyond the main service – i.e. jobs, skills, social cohesion; ensuring pilot funding ensures longer-term stewardship after the initial experimentation/pilot phase. The paper, however, found many potential synergies as well as conflicting priorities in the service delivery model for informal settlements. Hence, the development of such a model requires careful testing, rigorous ongoing academic critique, and a phased program of piloting and adaptive design before it is replicated more widely. This means appropriate funding is required to support the careful design and piloting phase. Also, since the model presupposes eventual state support, there should be explicit commitments from government to adopt such models (with subsidy support, inter alia) should they prove successful. This research has also demonstrated there is the potential for the delivery of sustainable services to marginalized urban poor households. Finally, commercial investments in such models, once proven, should value the wider socio-economic benefits of such delivery mechanisms and the investment of capital for financial return should be 'patient'; recognizing that targeting 'scale' too early is antithetical to the underlying principles of the model.

SE-11-34

Climate Change and Clean Energy Demand in Africa: The Way Forward for Policy Development

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Africa's energy shortcomings appear to have a settlement in harnessing its abundant renewable energy resources. However, the challenge of climate change appears to put this hope in jeopardy. Climate change will continue to exert significant impacts on the size and geographic distribution of the technical potentials for Africa's renewable energy resources, which will in turn increase their marginal costs of production. This is against the background that both population and the number of households will grow significantly to increase the demand for clean energy. Traditionally, the level of demand is expected to depend on population growth over time, the number of households, the efficiency with which energy services are delivered and the energy intensity of the activities in which people are engaged. This paper argues that climate change would be one of the most significant determinants of the demand for clean energy in Africa. The paper employs time series data mainly from the World Development Indicators to estimate the optimal marginal cost of renewable energy resources which can sustain the African economy. It assesses the economic challenges of climate change for renewable energy usage in Africa as against the use of fossil fuels. The analysis was based on the Hotelling Rule, which equates the price of fossil fuel to the sum of marginal extraction cost and user cost. Here, socially optimal resource extraction means net price increases at the rate of interest, for a nonrenewable resource like fossil fuel. The backstop energy resource used was solar energy. A log-log regression model was used in Stata, for fossil fuel consumed in Africa from 1960 to 2016 to derive private marginal cost for fossil fuel. While the average private marginal cost of fossil fuel increased by 60 per cent within the period, the average rate of change in marginal cost of solar photovoltaic decreased at 6 per cent per annum from 1998 to 2011. The results show that Africa should have switched to renewable sources as its main source of clean energy earlier than 2015. They also reinforce the fact that the marginal cost of solar photovoltaic systems will have a significant effect on the entire renewable energy set up in Africa. The paper recommends energy subsidy reforms in favour of renewable energy and the internalization of externalities of fossil fuel based energy, to create the right environment for Africa's clean energy breakthrough in the face of climate change.

SE-11-35

Hybrid Off-grid Renewable Power System for Sustainable Rural Electrification in Benin

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Rural areas in Benin are marginalised, in term of electricity assess due to their remoteness from the grid and difficulty to access although most of the country population lives in those places. However, Renewable Energy (RE) is free and available everywhere, offered a

unique opportunity to power these communities through decentralised energy system, but the intermittent nature of RE makes the supply power unstable. This study aims to analyse the techno-economic feasibility of off-grid Hybrid renewable energy system (HRES) for sustainable electrification in Benin, the case of Fouay village as well as analysing the Willingness To Pay (WTP) and Ability To Pay (ATP) of the community. The techno-economic analysis showed that hybrid PV/Diesel Generator (DG)/battery is the least cost optimal system with an overall Cost of $555492 and Cost Of Electricity (COE) of 0.207$/kWh. It ensures a reliable power supply, reduces battery costs by 30% compared to PV/battery system, achieving 97% CO_2 emissions reduction compared to standalone DG and has a high renewable fraction of 96.7%. PV/DG/Battery is economically viable than grid extension with a COE lower than the grid tariff of 0.22$/kWh. While the market analysis revealed a great Willingness to Pay of households and ability to pay for a cost of electricity of 0.45$/kWh higher than the COE of the design system. The study showed that compared to standalone PV system widely implemented in Benin and grid-connected system, off-grid HRES is more reliable, cheap and affordable and should be implemented across the country to power in sustainable manner rural community.

SE-11-36

Assessing Water Security in the Sisili-Kulpawn Basin of the Northern Region of Ghana

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The concerns about climate change in relation to water resource and its threats to agricultural production is increasing. This study assessed farmers level of water security and adaptation measures to aid farmers build resiliency towards water insecurity. This paper researched into water security in the Sisili-Kulpawn Basin (SKB) of the Northern Region (NR) of Ghana. Purposive sampling was used to sample 200 households which comprised of 100 irrigators and 100 non-irrigators. Yagaba and Loagri were the irrigation communities whilst Kunkwa and Wiasi were the non-irrigation communities selected for the study. The study used the Water Poverty Index (WPI) approach to assess the level of water security in the study area. The findings of the WPI model indicated that only Yagaba (57.2%) was water secured whilst Loagri (47.6%), Kunkwa (25.2%) and Wiasi (28.4%) were water insecured communities. The WPI pentagram reported high scores of water availability, access and use with regards to Yagaba and Loagri. Smallholder farmers are faced with the challenges posed by the erratic nature of rainfall and unpredictable flooding of farms at the lowlands by the Sisili-Kulpawn Basin (SKB). Farmers who farm the uplands are faced with long period of drought during the dry season. Climate change if not mitigated will increase the vulnerability of these smallholders by worsening the situations and this will elevate poverty levels. Stakeholders in Agriculture should train farmers on Adaptation strategies like crops with low water requirement, short duration crops, mulching among others to help farmers build long term resilience towards water security issues.

SE-12
Vulnerabilities

SE-12-37

Effects of climate change on farming communities in the Delta areas of Ondo State, Nigeria

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Current happenings and reports indicates that climate change will affect the health of people generally, and that current efforts to reduce or mitigate its effects are not only inadequate but almost wholly concentrated on the poor populations. This paper examines the consequences of climate and environmental change on the vulnerable groups in the Niger Delta region of Nigeria drawing from the case of Ondo State. Ondo State is one of the nine Niger Delta states of the 36 states of Nigeria and has the longest coastline in the country. It discusses adaptation measures and practices as well as the implications of climate vagaries on the farming population in the study area. The paper draws on a systematic survey of selected households head in the selected settlement over a six-month period. This is completed by focus group discussions and in-depth interview with selected individuals in the study area. In addition, other relevant materials and data were sourced from published sources. The study found that although the people are aware of climate change and its consequences not much has been done to mitigate its effects in the area. They know that the period of raining and dry seasons has changed and that yields from fishing and farming activities has been affected. The study also revealed that the current decision-making framework in the state has not made sufficient policies to cater for the vagaries of climate change impact on the people and the environment in the study area. The paper recommended policy initiatives and action to improve the existing situation in the area.

SE-12-38

Effect of Climate Change Adaptation Strategies on Income Inequality among Cocoa Farmers in Central Region of Cameroon

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Climate change is a major development hurdle in many African countries. In Cameroon, the impact of climate change on cocoa agriculture is alarming given sensitivity of several cocoa production stages to changes in weather parameters. This paper analyzed the impacts of climate change adaptation startegies on income inequality among cocoa farmers. The data were collected from 303 cocoa farmers in the Central region of Cameroon and analyzed with factor component and regression-based inequality decomposition approaches. The results showed that majority of the farmers (94.72%) were males, while average age was 50.62 years. The major adaptation strategies being used were livelihood diversification into other crops (66.34%), re-spraying of cocoa (51.82%), planting of hybrid cocoa varieties (48.18%) and monitor of weather through

forecasts from weather stations (35.31%). The computed Gini coefficient for the total income was 0.4284, while incomes from crop enterprises and non-farm wages were inequality reducing. Regression based decomposition revealed that perception of effectiveness of credit support and individual efforts to mitigate climate change, monitoring of weather with indigenous knowledge, planting of hybrid seeds, change of planting time and cocoa land areas were statistically significant ($p<0.10$). However, income source decomposition revealed that monitoring of weather with indigenous knowledge and effectiveness of individual efforts at climate change mitigation were inequality reducing. It was recommended that efforts at promoting non-farm incomes and enhancing effectiveness of climate change adaptation strategies would enhance incomes of cocoa farmers.

SE-12-39

Effect Of Climate Change Adaptation Strategies On Farmers Income In Kwara State, Nigeria

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Farming is the key to income, livelihood and food production in most part of Africa especially Nigeria but poor and smallholder farmers are hit climate change which adversely affect their livelihood status. This study is designed to assess the sources of income among farming households; identify the perceptions of farming household to climate change; identify various adaptation strategies to climate change used; determine the effect of climate change adaptation strategies to farmer's income. A three-stage sampling technique was used to select 140 crop farmers. Primary data were collected using a structured interview schedule. Descriptive statistics and ordinary least square regression were used for data analysis. The study reveals that majority of rural dwellers depend largely on farming activities as a means of livelihood to sustain their family. It was also revealed that majority of the households witnessed change in weather conditions as reflected an unusual downpour of rain. Also, it revealed that 51.7 percent of the households adopted early planting as adaptation strategies against climate change. It was discovered with the aid of Ordinary Least Square Regression that education and irrigation has a positive significant effect on farmer's income. The study recommended that farmers should be trained and supported on the use of more adaptation strategies.

SE-12-40

Analysing households' vulnerability and coping to climate-induced stresses in coastal Bangladesh: an asset-based analysis

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This study uses asset-based framework to analyse households' vulnerability and coping strategies in coastal villages of Bangladesh. It considered 40 indicators from five types of assets such as human capital, natural capital, physical capital, financial capital and social capital assets in order to assess households' asset vulnerability. Principal component

analysis (PCA) was used to explain how lack of asset holdings influence exposure to shocks. Then, the study also explains the relationship between households' vulnerability and coping strategies that were preferred to reduce their level of vulnerability. It used multistage cluster sampling technique to collect 156 in-depth interviews which had been chosen from four coastal villages. The results reveal that 23.1% of households were highly vulnerable, 56.4% were moderately vulnerable and 20.5% of households were less vulnerable to climate-induced stresses. Disaggregated results by geographical unit show that Buri Gualini and Gabura both have the highest percentage of highly vulnerable households (more than 40%), whereas Munshiganj and Ishwaripur have relatively lower percentages of households (28.21% in both unions) in highly vulnerable category that other two unions. The analysis of PCA shows that the main determinants of coastal households' vulnerability and adaptive capacity include access to disaster management trainings, safe-drinking water, assess to different safety net programmes, access to cash savings and access to livestock and households' productive assets that could bring income. The interrelation between vulnerability index and coping strategies reveals that highly vulnerable are somewhat more likely than other two categories households to have different coping strategies, though the relationship is weak. The outcomes of this study must explain factors that shape differentiated vulnerability and coping strategies in the African context. The African experiences help to conclude with implications of these findings for supporting coping and adaptation strategies of poor in the context of climate change.

POSTER ABSTRACTS

PS-01

The Use of Biodegradable Waste to Provide Solution to Climate Change Issues in Nigeria [Akinleye I. Oyegbami*, Moses O. Oyatogun; Federal University of Agriculture, Nigeria]

The ever increasing carbon and other factors causing climate change, also the cost of crude oil and unstable power supply in the country needs attention. Several trials had been done by the innovators, several conventions had been held but some of them are futile, while others seem costly. Biogas is another cheap way of reducing carbon emission and generating energy. In this research, a house and Federal University of Agriculture, Abeokuta Farm were used in Abeokuta Ogun State to test the production of gas from biodegradable waste. The biogas digester was constructed to the toilets in the building directly and left for a period of 3 weeks for the gas to produce, when bacteria act on the biodegradable material (human waste) the water tank inside rises and effluent (liquid fertilizer) was coming out from the outlet (urinary), while the gas was trapped at the apex of the digester and was passed to the building for use. The outcome of this research has given us a clear direction as to how to tackle this issue of domestic waste bioconversion especially human waste (excreta). Therefore, for developing countries of Africa and especially, Nigeria to survive her current energy crisis, the anaerobic digestion process could provide the much awaited solution if given the desired attention and also reduce the rate of carbon emission in the air.

PS-02

Spatial disparities in malaria transmission in the health district of Nanoro, Burkina Faso [Eli Rouamba*, Karim Derra, Jeremi Rouamba, Halidou Tinto; University of Ouagadougou, Burkina Faso]

In West Africa, population dynamics are characterized by an exponential increasing of demography and important migratory flows. The persistence of live styles and the practices of society contribute to the degradation of landscapes and change in physical and human environment. These changes have consequences on the distribution of diseases such as malaria which vectors are dependent of environment control. A better understand of factors involved in the transmission on the disease is necessary and geographical information systems (GIS) could contribute to that. Key words: Nanoro, GIS, dynamic of transmission, environment, Burkina Faso. Methods A cross-sectional study was conducted in 02 villages of the health district of Nanoro from October 2012 to April 2016. A questionnaire was submitted to the household head to collect information on household size, type of habitat, structure and the property of the family, the type of toilets used and sewage disposal method. A form has been also filled for each village. The mains potential breeding sites (domestic breeding site, puddle and laundry site) have been georeferenced by GPS and the distance calculated using Arc GIS (geographic information systems) software. Results A total of 1000 households in 200 families were investigated for a population of 9882 persons. Malaria prevalence per village varied between 21% and 42%. By crossing health data with environmental data under GIS showed the households located less than 1 km of risk sites (dams, watercourses, etc) were more exposed to malaria. The risk was even greater (25%) when the wall is built in “banco” (85%) and the clay roof (11%). The use of family courtyard as domestic breeding site (95%) has been associated to high malaria (14%). Conclusion A good characteristic of sociodemographic

and environmental profile and an increasing of these data under GIS could allow a better understand of malaria transmission.

PS-03

Climate Change and Sustainable Development In Developing Countries [Georges Ilunga Kaponsola; Ministry of the Environment, Republic of Congo] Email: forourdyingplanet@gmail.com

I. History Concerned with desire for wellbeing, human intensified industrial activities since 14th century. II. Consequences Air pollution, raise of temperature, apparition of extreme events, affecting agriculture, fishery, marine life, water resources availability, industry, human health and so on. We note excessive rain, inundations; drought, decrease of harvest, hunger, diseases, move of population, lack of progress, permanent poverty, and so on. In poor countries, the majority of people have agriculture as livelihood. Menace of Agriculture = Menace of life. The most pressing concerns in developing world, relate to impacts of increased temperatures and water shortages on crop production, decrease of food security, impacts on health; apparition of malaria in Africa and diseases from under-nutrition, exacerbate poverty in already poor regions of the world. III. Recommendations Governments are invited to register poverty reduction into policies and strategies; educate people anywhere they live and act; introduce regulations and policies endowing countries with services of climate observation, warning people on how to adapt to climate changes; give people access to bank credit to allow sustainable development. Developing countries have to build their development on the basis of renewable energies; in replacement of polluting sources anywhere they are found.

PS-04

Mapping human settlements and population density in the Democratic Republic of Congo using Landsat data [Patrick K. Lola Amani; University of Maryland, USA]

Population maps are dependent on the availability of up-to-date, spatially-explicit population census data, typically created by disaggregating population estimates from census units and attributing them to mapped human settlements footprints. Previous studies have demonstrated the ability to distribute population more precisely over land by using satellite-derived estimates of settlement locations. The Democratic Republic of Congo (DRC) represents a challenge to population estimation because of a large and mostly rural population and a lack of data on settlement locations. We report here a study that generated three products for the DRC: 1) a map of settlement distribution, 2) a new estimate of national population, and 3) a map of population distribution within settled areas. Our methods: we first mapped human settlements using a supervised, a decision-tree classification of Landsat imagery, assessed map accuracy and bias using stratified random sampling and report the adjusted areas of settlements with known uncertainty. For the total population, we conducted a stratified-random sample, with strata based on the settlements map. For each sample we manually counted observable dwelling units, using high-resolution satellite imagery available on Google Earth, and multiplied by the national mean number of people per dwelling, provided by the 2013-2014 Demographic Health Survey (DHS). For the map of population density, we again used a decision-tree regression, this time of the population values from the same sample points against Landsat imagery. We estimate the total settled area in DRC at 12,930.17 km² or 0.55% of the national land area (2,345,000 km²). We estimate DRC's total population in 2013 at 101.4M inhabitants. Of these, 18.8% live within 300-m of all mapped settlements. DRC remains a very rural country, where over 51.1 percent of the population lives beyond 50 km from a major city. This study provides the first model-based estimate of national

population as well as the first fine-resolution estimation of settlement and population distribution. These data can allow improved land use planning at the national and sub-national scales.

PS-05

Strengthening urban resilience through Sister City Partnerships: The experience of Leper-Wa [Raymond Aitibasa Atanga; University for Development Studies, Ghana]

About seventy percent (70%) of the world's cities are engaged in some form of international partnerships and sister city agreements. Many of these partnerships occur between cities in the developed and the developing world. In the light of ongoing decentralization, globalization, urbanization, a growing sense of global citizenship and the quest to achieve sustainable development, cities can be insular anymore and hence, are increasingly engaged in sister city relationships both as development agents and as beneficiaries. The motives for sister city partnerships have varied from cultural exchanges, solidarity-driven perspective, mutual benefits to tackle urban challenges or to get inspiration from good practice of partner cities. This paper assesses the extent to which sister city partnerships are facilitating urban resilience in emerging cities such as Wa. Data for the study was collected from partnership agreements, reports, observation of project sites and interviews with partnership committee members as well as assembly members, and analysed using the Institutional Collective Action (ICA) framework. The findings show that sister city partners is beneficial to an emerging city such as Wa. Among the benefits are; knowledge transfer, capacity building, improved water and sanitation, provision of social services, local economic development and women empowerment. These benefits has enhanced the resilience of Wa. The study recommends the fostering of North-South partnerships for urban resilience in emerging cities in the global South. Key words: urban resilience, sister city, partnerships, Ieper-Wa

PS-06

Pressure of rising population: Management issues in the megacities of India under a changing climate [Shadananan Nair Krishnapillai; Centre for Earth Research and Environment Management, India]

Uncontrolled migration leads to spreading of slums, resulting in environmental degradation in the megacities – Mumbai, Delhi, Kolkata and Chennai - of India. Administration fails to provide basic necessities such as safe water, energy and sanitation to the fast rising population. Things are worse in Mumbai where half of the population lives in slums. In terms of the population exposure to coastal environment, Mumbai and Kolkata are at high risk. Rural unemployment, industrial development, changing climate and the growing economic imbalance are prominent factors behind urban migration. Unwise planning and construction of sewerages and disposal of solid wastes create flooding, polluting entire water resources. Poor sanitation together with insufficient basic infrastructure creates serious health issues. Extremes in climate add to this. Escalating number of vehicles, inefficient traffic system, poorly maintained roads and encroachment of footpaths by street vendors create long hours of traffic jam. Industries and urban settlements do not have proper treatment. Rising population leads to several social issues such as conflicts over the allocation of water, food, energy and land. Population control and urban planning and management have become complicated, as they involve several socio-economic, environmental and political issues. Present study analyses the impact of increasing population in the megacities of India under a changing climate and environment. There are options to overcome the crisis such as satellite cities with all basic facilities, increased

rural employment opportunities to discourage migration, urban poverty eradication schemes with the help of private sector and NGOs and modernisation of the urban infrastructure to cope with the changing demographic and climate patterns. India needs an appropriate urban policy and population policy to meet the challenges. Guidelines for this have been provided.

PS-07

Adaptation strategies to climate variability and climate change; Impacts on food security among smallholder farmers in Katakwii District, Eastern Uganda

[Anthony Esabu; Climate and Food Security Department, Uganda]

For the coming years, changes in temperature, carbon dioxide (CO_2) concentration, and precipitation under the climate change scenarios present a challenge to crop production globally. Uganda like other African countries is and has been impacted by climate change (CC) and climate variability (CV) mainly on agriculture which is the main source of livelihood in rural areas, thus adaptation strategies on CC and CV are unavoidable among smallholder farmers. This study aimed at evaluating the implications of adaptation strategies to CC and CV on food security among smallholder farmers in Katakwii District in Eastern Uganda. The specific emphasis was on the understanding of farmers' perceptions, capacities and limitations of adaptive strategies among farmers. A total of six (6) villages were considered namely; kokorio, orimai, magoro, omodoi, Akurao and Toroma From each village, ten (10) farmers were selected for interviews using simple random sampling approach, thus making a total of sixty (60) respondents. Both quantitative and qualitative design were used in this research study. Different data collection instruments were used including: Focus group discussions, individual interview, field observations mixed with interviews and questionnaire survey method (semi-structured and open). The results show that farmers have experienced CC and CV mainly increased temperature, rainfall variability and increased pest invasions in all agro-ecological zones thus impacting crop production. Food insecurity was experienced mostly by farmers in Kapujan and Kokorio. The soil water conservation practices, introduction of new crop varieties, stop cultivating some crops, as well as mixed cropping were found to be the most opted adaptation strategies to CC and CV. The possibilities of farmers to practice adaptation strategies effectively were mainly limited by low financial and lack of agricultural based skills. Population increase and poverty have been found to be other factors contributed to food insecurity. However, the diversifying HH income sources, reducing number of meals eaten per day and casual laboring were found to be adaptation strategies to food insecurity. Government should enhance sustainable adaptive strategies for reducing the impacts of CC, particularly for the most vulnerable region and social groups.

PS-08

Analysis of Climate Change Induced Forced Migration in Sub-Saharan Africa

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Knowledge of how climate change affects migration remains limited and fragmented. This study provides analysis of the impact of environment induced changes attenuating human mobility in Sub-Sahara Africa by investigating the key issues bothering on social and political contexts. Climate model results show that precipitation patterns are expected to change, where water availability may fall by 20-30%, under a conservative 2°C increase by 2100 leading to stressed local freshwater supplies, reduced crop yields and desertification. The increase in temperature has been found to be associated with a 2.66%

reduction in the growth of agricultural output, leading to estimates of economic growth reductions by an average of 1.3% points for each degree of warming. Due to land loss for farming and grazing, the political instability of the region has increased since the 1980s due to the several communal clashes occurring in the region in dispute for the remaining arable land. Thus a 54% increase in armed conflict within the sub-Saharan Africa has been linked to the resulting mass migrations. This article examines how climate change affects international migration and its economic implication on Sub-Sahara Africa, especially the implications on political and social landscapes as well as how it induces poverty, land loss and ethnic clashes.

PS-09

The impact of climate and environment on seasonal malaria transmission in sub-Saharan Africa [Edmund I. Yamba[1]*, Adrian M. Tompkins[2], Andreas H. Fink[3], Volker Ermert[4], Olivier Briet[5], Leonard K. Amekudzi[1]; [1]Department of Physics, KNUST, Ghana, [2]International Centre for Theoretical Physics, Earth System Physics, Italy [3]Karlsruhe Institute of Technology, Germany, [4]University of Cologne, Germany, [5]Swiss Tropical and Public Health Institute, Switzerland]

Climate and environment play a significant role in seasonal malaria transmission in sub-Saharan Africa. Previous studies that have examined the impact of climate and environment on malaria seasonality in the sub-region scarcely used monthly Entomological Inoculation Rate (EIRm) as a metric. This study, therefore, gathered EIRm data across different climate settings over sub-Saharan Africa and used it to investigate the link between climate variables and malaria seasonality. The results showed that important climatic factors explaining malaria seasonality in the sub-region were rainfall and maximum temperature at Sahel, rainfall and mean temperature at Guinea, only temperature (minimum, mean and maximum) at Equatorial East Africa and weak or complex climate influence at Equatorial West Africa. It was also found that the delay between the onset of rainy season and malaria season was 1 month at the Sahel, 0 months at both Guinea and Equatorial West Africa, and 2 months at Equatorial East Africa. The seasonal distribution of malaria was found to have a high tendency towards uni-modal distribution with peaks mostly associated with the first rainfall maximum of the year. The outcome of this study is useful for improvement and validation of weather-driven dynamical mathematical malaria models that have the potential to forecast seasonal malaria for the region. Further studies are needed to establish the causal weak relationship between climatic variables and malaria seasonality in Equatorial West Africa.

PS-10

Assessing the Performance of Empirical Net Radiation Models in a Grassland Ecosystem during the DACCIWA Field Campaign [Jeffrey N. A. Aryee*, Edmund Yamba and Leonard K. Amekudzi; KNUST, Kumasi, Ghana]

Net radiation flux information plays a crucial role in the modeling of soil-atmosphere interactions. It forms the fundamental representation of effective energy balance between outgoing and incoming shortwave and long wave radiations by sun and earth surface to heat soil and air, as well as transport and redistribute mass, momentum and energy in the short to long term. Standard weather stations, aside providing information on air and soil temperatures, relative humidity and wind properties, mostly only provide profiles of downwelling shortwave radiation. With omissions of long wave radiations and upwelling shortwave radiation, estimation of the net radiation flux becomes challenging. In this study, various empirical methods were employed on a grassland ecosystem to (i) estimate the

net radiation flux and (ii) assess the performance of the various methods. The methods comprised of temperature- and sunshine-based approaches, which depended either solely on or a combination of surface air temperature, dewpoint temperature, soil temperature, relative humidity and sunshine hours. First, half-hourly surface ancillary datasets were retrieved from the energy flux setup (FT) and automatic weather station (AWS) deployed during the Dynamics-Aerosol-Chemistry-Cloud Interactions in West Africa (DACCIWA) field campaign organized in June – July 2016. Thereafter, the empirical methods were applied on the downwelling shortwave radiation component from the FT and further compared to the net radiation flux estimates also retrieved from the FT. Generally, the results showed that the methods largely agreed with the observed net radiation flux. Nonetheless, the temperature-based approach outperformed the sunshine method. The findings of this study provides information on the relative performance of the these empirical methods, and suggests the most reliable net radiation estimation method necessary for soil-atmosphere coupled modeling.

PS-11

Economics Of Climate Change Adaptation Strategies Among Sorghum Farmers In Kwara State, Nigeria [Muhammad-Lawal, A, Osasona, K.K*, Olaghere I.L , Yunusa S.O; University of Ilorin, Nigeria]

Sorghum is a major cereal crop among farmers and has a lot of food security importance in Kwara State. There has been paucity of empirical information in the area of adaptation strategies to climate change in relation to sorghum production in Kwara State, Nigeria and to sustain the yields of sorghum in Nigeria, there is need for assessing climate change adaptation strategies among sorghum farmers in the State. This study, therefore, designed to identify adaptation strategies to climate change used in sorghum production; identify the determinants of investment on adaptation strategies and identify the constraints to climate change adaptation strategies; A three-stage random sampling technique was used to elicit information from 145 sorghum farmers from the 5 LGAs in Zone C of the KWADP. Major tools of analysis for the study included descriptive statistics, ordinary least square regression and likert-type scale. It revealed that sorghum farmers frequently use organic manure (60%), fertilizer (83%), crop rotation (86%), and ploughing (87%) as adaptation strategies against climate change. Use of adaptation strategies also had shown that an increase (100%) in the use of all adaptation strategies will increase the yield of sorghum by 27% as revealed by correlation analysis. It was discovered with the aid of Ordinary Least Square Regression that the number of strategies used, farming as source of income, farm income and farm size have positive relationship with the costs incurred by farmers. The study recommended that farmers should be trained and supported on the use of more adaptation strategies. Policies that will increase development and farmers' assess to improved sorghum varieties should be encouraged. Key words: Adaptation strategies, climate change, sorghum production, Nigeria

PS-12

Integrated Analysis of factors influencing Coastal Erosion in Deltas: A Bayesian Modelling Approach [Jayson-Quashigah, P. N.[1]*, Amisigo, B. A.[2], Ayamga, J.[1], Appeaning-Addo, K.[1]; [1]University of Ghana, Ghana, [2]Water Research Institute-CSIR, Ghana]

Deltas play host to some of the highest populations with over some 500 million often poor residents who largely rely on the natural ecosystems for their livelihoods. However, there exist complex interactions between the numerous factors such as wave and tidal actions, storm surges, fluvial sediment loads and anthropogenic actions influencing the coastal

dynamics and erosion. Erosion then leads to loss of land and displacement of people, which negatively impacts their livelihoods. These interactions are less understood and are further compounded by climate change impacts such as sea level rise. There have been various attempts to model these interactions to better inform decision making in coastal zones but many of these models do not consider the factors at play in an integrated manner. Here, we developed a Bayesian belief network (BBN) model that establishes probabilistic relationships between interacting biophysical and socio-economic factors influencing coastal erosion under climate change using the Volta Delta of Ghana as a case study. The model demonstrates how various factors impacting coastal erosion can be analysed in an integrated manner, allowing for better predictions of these impacts under climate change. The developed BBN model can be used as an effective tool for exploring stakeholder-driven management interventions and their impacts on coastal erosion.

PS-13

On the Development of Localized Convective Eddies along the Ghana Coastline [Samuel Owusu Ansah; Ghana Meteorological Agency, Ghana]

During the major and minor rainy seasons, chains of localized convective eddies (LCEs) are often observed traveling along the coastline of Ghana. In this study, we adopt the Weather Research and Forecasting (WRF) model to simulate this phenomenon, and then use the newly developed methodology, localized multiscale energy and vorticity analysis (MS-EVA), to investigate the dynamical processes underlying the genesis, maintenance, development, and decay of these eddies. The WRF model is initialized with the NCEP FNL (Final) Operational Global Analysis data (a 1-degree resolution) prepared operationally every six hours. It is set up with a nested domain (for a 27km, 9km, and 3km resolution, respectively). Rainfall data are assimilated into the model to accurately simulate the numerous recurring phenomena (usually during the peak season). The model outputs are shown to be well correlated with in situ data. With the MS-EVA analysis, three typical cases are examined in an attempt to explore the multiscale energetics associated with the LCEs evolutions. It is found that, for all the cases, baroclinic instability dominates in the generation and amplification of the mesoscale eddies, although the detailed Lorenz cycle may differ from case to case. Keywords: Localized Convective Eddies (LCEs), Weather Research and Forecast (WRF), localized Multiscale Energy and Vorticity Analysis (MS-EVA), Baroclinic and Barotropic instabilities

PS-14

Flooding Vulnerability, Causes and Coping Strategies around Rivers Ilo and Akesan Floodplains, Aboru, Lagos, Nigeria [Alabi S.O. Soneye, Oluwatoyin Ogunseyin, University of Lagos, Nigeria]

Hazards risks and vulnerability assessments are fundamental to effective and sustainable management of hazards and disaster emergencies. They however remain unappreciated, and therefore unpopular, in most part of the developing world despite that the populace is becoming more exposed and less secured increasingly. The paper examined the vulnerability of the typically low income community of Aboru along the floodplains of Rivers Ilo and Akesan, Lagos, to perennial flooding hazards and the coping strategies by the affected population. It also assessed the humanitarian relieves accessible by victims during and after the floods as well as their perception of the environmental menace. Geographical Information System technology was adopted to integrate spatial data from relevant sources with that of the people's perception through social surveys. The result reveals four flood vulnerability zones with the highest vulnerable zone having the highest number of buildings and population. High runoffs during rainy season, poor drainages and

indiscriminate disposal of domestic wastes into the few existing drainage channels are identified as the major causes of the hazard in the area. No major humanitarian services or assistance are being provided. Awareness creation and provision of sustainable drainage systems are recommended as lasting mitigation to the environmental problem.

PS-15

Suitability of Inland valleys for rice production under climate change: drivers of rice production and consumption in lowlands [Thomas Bindayaoba Yameogo, West African Science Service Center on Climate Change and Adapted Land Use (WASCAL), Burkina Faso]

This study examines the factors that impact farmers' production decisions in inland valley and the use of the output. To this end, 16 inland valleys (developed and undeveloped) located in four rural communes of the province of Ioba were purposely selected. The statistical analysis reveals that yields of rice differ significantly between developed and undeveloped inland valleys rice plots, and between male and female farmers, respectively; implying "Inland valley un development effect" on one hand and "gender effect on the other". Heckman probit model were used to avoid sample selection bias. The regression results indicate that farmers' behaviours in developed inland valley is gender neutral; while in the other side, in undeveloped inland valley, gender plays a significant role on farmers decision. Indeed the study found that, when given a chance to have their own plot, women can performed as well as men. As hypothesized, the results reveal that access to extension services significantly and positively drive rice production in developed Inland valleys; while it effect in undeveloped inland valley is non-significant. It comes out from this study, that farmers are consuming their production because of local market failure probably due to price instability and/or lack of outlets for output.

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