



# 2nd International Conference on

**GEOGRAPHICAL SCIENCE FOR RESILIENT  
COMMUNITIES, ECOSYSTEMS AND LIVELIHOODS  
UNDER GLOBAL ENVIRONMENTAL CHANGE (GORILLA)**



**7 - 10 DECEMBER 2022  
PROTEA HOTEL, KAMPALA - UGANDA**

<http://gorilla.mak.ac.ug>

## Message from Chairperson, Conference Organizing Committee

*Dr. Yazidhi Bamutaze, Associate Professor and Deputy Principal,  
College of Agricultural and Environmental Sciences, Makerere University*



It is a great pleasure that we once again welcome you to Kampala for the second International Conference on Geographical Science for Resilient Communities, Ecosystems and Livelihoods under Global Environmental Change (GORILLA). We are gratified by the nearly 200 abstracts submitted for the conference. As you already know, the interdisciplinary GORILLA conference seeks to make a contribution to the realization of the Global Development Agenda 2030 and the AU Agenda 2063. While the Global Development Agenda was agreed on in 2015, an inspection of the current state, 7 years down the road gives dismal progress on many targets of the SDG targets and priorities of the Sendai Framework for Disaster Risk Reduction, particularly for developing countries. The annual COP meetings and their outcomes have recently given a glimmer of hope in reinvigorating the path to sustainability and thriving. In order to address the pressing contemporary issues, the 2<sup>nd</sup> GORILLA conference has been collapsed into eight subthemes i.e. (a)Biogeography, Biodiversity and Ecosystem Conservation(b)Land Degradation Neutrality and Net Zero(c)Water resources and water systems in the Anthropocene(d) Migration and Displacement: Socio-ecological Intricacies and Benefits(e)Climate Smart Agriculture for Sustainable Resilience(f)Nature Based Systems in Mitigating Hydro-meteorological Hazards and Disasters (g)Geographies and Contexts of COVID-19 Processes and Sustainable Recovery(h)The Future of Smart Cities and Urban Systems in SSA. These subthemes, coupled with keynote addresses, the high-level panel discussion, special sessions are expected to elevate the conversations geared at cultivating solutions and strategies for achieving the development goals and aspirations. We have created a platform geared at bridging the science-policy-practice gaps and deriving actionable and policy-oriented measures that can potentially transform societies. For those in academic, we have planned a special issue publication with the African Geographical Review (AGR) Journal, which will also commemorate the MAK@100 celebrations. Lastly, I wish to acknowledge the generosity of the various sponsors and partners whose support has enabled the 2<sup>nd</sup> international GORILLA conference to be successful.



**Session 4b: The Future of Building Smart Cities and Urban Systems in SSA**

**THURSDAY 8<sup>th</sup> DECEMBER 2022 – 4:15 – 6:00 pm**

**Venue: Main Hall B**

- 1) An Assessment of Climate Extremes in Mbale Municipality in Eastern Uganda – *George Oriangi*
- 2) Urban heat hazard exposure and future likelihood in Kampala city, Uganda – *Hakimu Sseviiri*
- 3) How can the geographic visualization tools facilitate sustainable development of communities under global environmental change? – *Tomasz Opach*
- 4) Assessing the Accuracy of OpenStreetMap (OSM) Building Layer in Jinja District, Uganda – *Joseph Kamoga*
- 5) Predicting Land use Land cover change of Jos-Bukuru Metropolis Plateau state through integrated CA-Markov approach – *Nanpon Zitta*
- 6) Towards sustainable urban tourism development in Uganda: A Risk analysis framework – *Jim Ayorekire*
- 7) Modeling the implication of household off-grid energy consumption in Suleja Lga of Niger state, Nigeria – *Bamiji Michael Adeleye*
- 8) Potential contribution of urban road-side plant nurseries to plant conservation and human well-being in the face of climate change, Uganda – *Edward Nector Mwavu*
- 9) Investigating peri-urban farmland by a mixed spatial and socio-economic approach aiming at a typology of peri-urban agro-systems in Nairobi-Machakos Counties Interface, Kenya – *Martinien Arcadius Ahogle Agassin*
- 10) Effect of the activity of black soldier fly larvae on the quality of compost produced from different organic waste sources at Makerere university agricultural research institute – *Ali Ssenabulya*

## Local Organizing Committee

Name	Institution
Yazidhi Bamutaze (Chairperson)	Makerere University
Jerome S. Lugumira (Co-chair)	NEMA
Frank Mugagga	Makerere University
Goretti Nabanoga	Makerere University
Eria Serwajja	Makerere University
Jackie Bonabana	Makerere University
Fredrick Tumwine	Makerere University
Jane Bemigisha	ESIPPS
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Patrick Musinguzi	Makerere University
Bob Nakileza	Makerere University
Prossie Nakawuka	Makerere University
Ronald Semyalo	Makerere University
Benita Rumanzi	African Population Institute
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Denis Wamala	Makerere University
Abel Nzabona	Center for Basic Research
Saul Daniel Ddumba	Makerere University
Jacqueline Kibirige	Makerere University
Martin Okwir	BRAC (Uganda)
Daniel Waiswa	Makerere University
Rhoda Nakabugo	Makerere University
Mr. Daniel Kisitu	Makerere University
Milton Kwesiga	ADRREM
Thomas Enuru	Makerere University

## International Scientific Committee

1. Mike Meadows: University of Cape Town (South Africa)
2. Odwa Atari: Nipissing University
3. Inocent Moyo: University of Zululand (South Africa).
4. Nibedita Ray-Benetti: University of Leicester (UK)
5. Chris Nshimbi: University of Zululand, South Africa: (South Africa)
6. Udo Schickhoff: Institute of Geography, University of Hamburg, Germany.
7. Suraj Mal: Center for Earth System Research and Sustainability (Germany)
8. Oyama Shuichi: Kyoto University (Japan)
9. Wenwu Zhao: Beijing Normal University (China)
10. Joy Obando: Kenyatta University (Kenya)
11. Mihai Voda: Dimitrie Cantemir University Romania
12. Henry Bulley: City University of New York (USA)
13. Raymond Tutu: Delaware State University (United States)

**Thursday, December 8th, 2022**

8:00 – 8:45	<b>Registration continued</b>
8:45 – 9:00	<b>SESSION 1:</b> Welcome remarks and Conference overview: <b>MAIN HALL</b>
9:00 – 10:45	<b>SESSION 1:</b> Keynote Presentations: <b>MAIN HALL</b>
10:45 – 11:15	<b>Tea Break</b>
11:15 – 12:00	High Panel Discussions: <b>MAIN HALL</b>
12:00 – 1:00	<b>SESSION 2: OFFICIAL OPENING AND GROUP PHOTO</b>

1:00 – 2:00	<b>Lunch Break</b>		
2:00 – 3:45	<b>Session 3 a:</b> Water resources and water systems in the Anthropocene  <b>MAIN HALL A</b>	<b>Session 4a:</b> The Future of Smart Cities and Urban Systems in SSA  <b>MAIN HALL B</b>	<b>Session 5:</b> Land Degradation Neutrality and Net Zero  <b>BOARD ROOM 3</b>
			<b>Session 6:</b> Migration and Displacement: Socio-ecological Intricacies and Benefits  <b>BOARD ROOM 2</b>
	<b>Session 7:</b> Geographies and Contexts of COVID-19 Processes and Sustainable Recovery  <b>BOARD ROOM 1</b>		
3:45 – 4:15	<b>Tea Break</b>		
4:15 – 6:00	<b>Session 3b:</b> Water resources and water systems in the Anthropocene  <b>MAIN HALL A</b>	<b>Session 4b:</b> The Future of Smart Cities and Urban Systems in SSA  <b>MAIN HALL B</b>	

## PREDICTING LAND USE LAND COVER CHANGE OF JOS-BUKURU METROPOLIS PLATEAU STATE THROUGH INTEGRATED CA-MARKOV APPROACH

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The dynamics of Land use Land cover (LULC) is an essential concern that affects the global environment, climate change, and sustainable development and Jos-Bukuru Metropolis is not an exception. Hence, detecting and predicting these changes will help in deriving active land use and planning policies that fits the local conditions. Landsat images of the years 1986, 2000 and 2019 were used to study the spatio-temporal distributions pattern of LULC. The study is aimed at modelling these changes using the integrated CA-Markov process. The maximum likelihood algorithm and cross tabulation technique (CTT) was performed to analyze these spatial changes. Validation and prediction using CA-Markov was performed. The accuracy of classification obtained are: 0.9659, 0.9510, and 0.9537 for 1986, 2000 and 2019 images respectively. Change detection from 1986 to 2000 reveals that built-up areas and rocks have positive image difference while vegetation, water body, mining area and open space with negative image difference. Built-up area continuously dominate with annual rate of change (ARC) by 6.27% from 1986 to 2000 and 2.17% from 2000 to 2019 while rock has 5.80% and 0.45%. - 2.82%, -0.87%, -8.00% and -5.265 for vegetation, water body, mining area and open space from 1986 to 2000. Likewise -0.48%, -0.88%, -2.78% and -2.65% from 2000 to 2019. CA-Markov analysis was used to predict LULC of 2019 where a Kappa statistics of validation was 0.8083. This shows a substantial level agreement. Based on the analysis of LULC change, this has revealed that there is rapid conversion of LULC classes most especially, vegetation cover, water body, mining area and open space to built-up. The worst hit LULC is open space while built up continually shows significant increase based on the predictive LULC.

**Keywords:** CA-Markov; Land use; Land cover