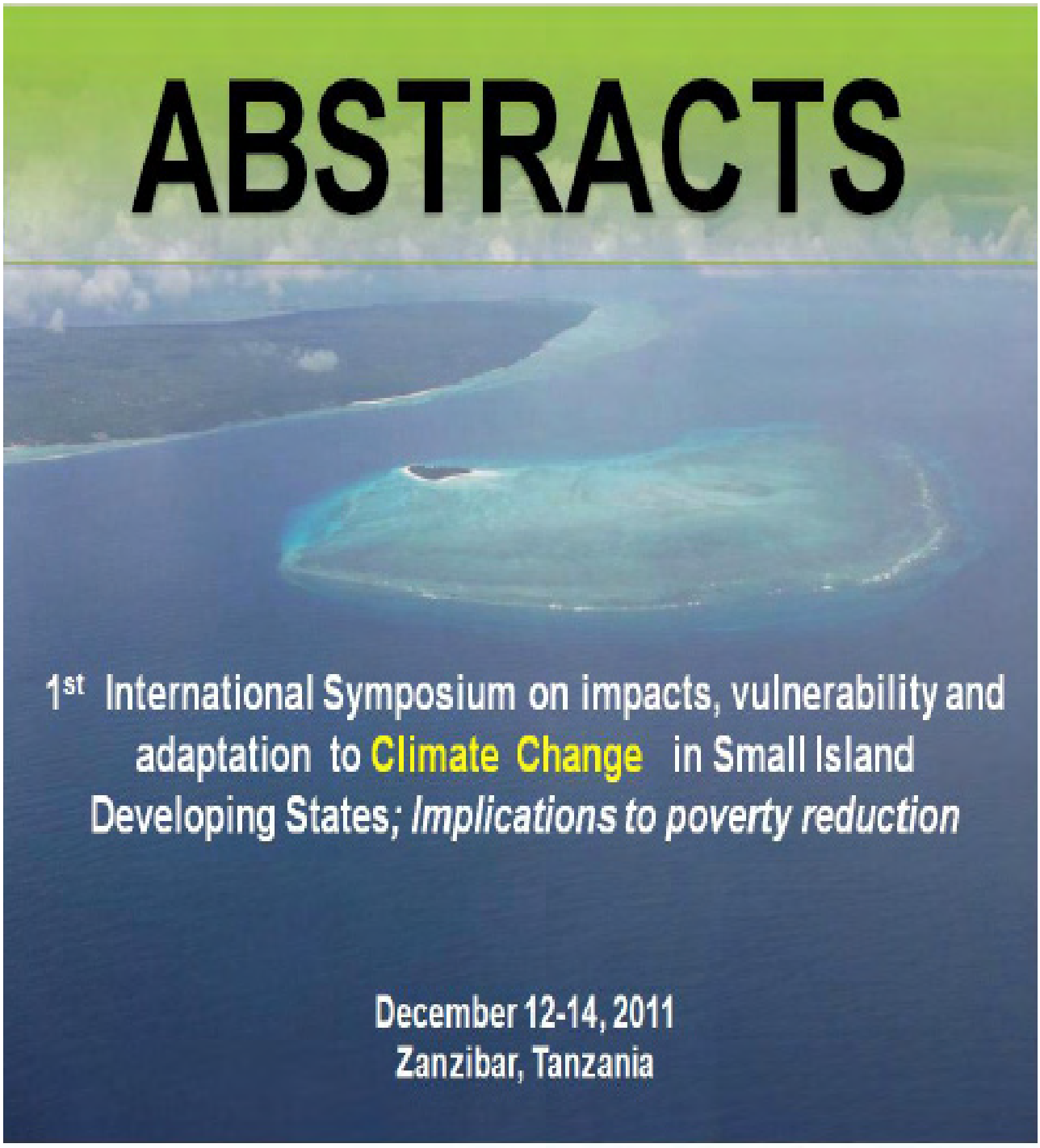
ABSTRACTS



1st International Symposium on impacts, vulnerability and adaptation to Climate Change in Small Island Developing States; *Implications to poverty reduction*

December 12-14, 2011
Zanzibar, Tanzania

Organizers

SMZ
SERIKALI YA MAPINDUZI ZANZIBAR

SUZA
STATE UNIVERSITY OF ZANZIBAR

ZANZIBAR INSTITUTE OF FINANCIAL ADMINISTRATION
Skills With Technology For Development

2011

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10Th Anniversary

PLENARY

1. The Economics of Climate Change in Zanzibar

Paul Watkiss

Oxford University, UK

Previous studies in East Africa and in Tanzania (see Watkiss et al, 2011) have assessed the economics of climate change. These studies reveal that current climate variability already has high economic costs and that the region has a large adaptation deficit. They also report that future climate change will have major economic impacts, which could be significant in terms of economic growth and development objectives. While adaptation can reduce these impacts, it has a cost, and requires significant funding, effective policy, institutions and mechanisms, and a new analysis framework that considers decision making under uncertainty.

At the same time, these previous studies highlight that the current use of energy is leading to economic, social and environmental costs, and that an alternative low carbon growth pathway could be more sustainable, and would also allow provide potential sources of carbon financing. A large number of no regret or low cost options are available that reduce GHG emissions, while also providing wider benefits.

This paper will discuss these previous results, and report on the initial findings from a new study, which is downscaling the economic assessment to Zanzibar. It will report on the specific issues for small island states, and discuss the linkage with the proposed climate change management framework for Zanzibar and the progress of climate change adaptation and low carbon policies.

References

Watkiss, P. Downing, T.,Dyszynski, J., Pye, S. et al (2011).The Economics of Climate Change in the United Republic of Tanzania. Report to Development Partners Group and the UK Department for International Development. Published January 2011. Available at: http://economics-of-cc-in-tanzania.org

2. Response of coral reef to global warming and ocean acidification and possible drastic change

Tamotsu Oomori

Department of Chemistry, Biology and Marine Sciences,
University of the Ryukyus, 1-Nishihara, Okinawa 903-0213, JAPAN.

Coral reef is a biologically diverse ecosystem and provides many services to human communities, however, it is facing to environmental changes such as global warming and ocean acidification. In recent decades, increase in atmospheric CO2, due to the anthropogenic activity such as fossil fuel burning, deforestation and cement production, is apparently recognized from 280 μatm in 1880 to 385 μatm in 2010, which will induce the Earth's climate change and hence function to the marine and terrestrial ecosystems.

The Ryukyu archipelago locates at subtropical-zone of north-west Pacific region and hosting diverse amount of biological species in coral reefs and on land. In this presentation, the following topics will be discussed;

1) Over view of subtropical coral reefs around Ryukyu Archipelago
2) Change of carbonate system in coral reef and adjacent ocean

(1) Long-term time-series monitoring of PCO2 in sea water and air-sea CO2 flux as well as organic and inorganic carbon production have been carried out at on site of coral reef since 2000. (2) Growth band study of sclerosponge is carried out to monitor the environmental change in the past decades. The δ13C value

in carbonate skeletal bands decreased drastically since 1960's, which suggests that anthropogenic CO2 is intensively introduced into surface sea water. (3) We also studied the change in carbonate system in water column around the Ryukyu Archipelago in decade. It is seen that aragonite saturation decreased and critical depth of aragonite saturation became shallow. As summary, carbonate system in coral reef is mainly controlled by photosynthesis and calcification processes both in organisms and in coral reef community, as well as CO2 budget through air-sea interface and at bottom water-sediments. It is noted that calcification rate of marine calcareous organisms in coral reef community decreases according to the decrease in aragonite saturation, and it would become negligible at early next millennium in the earliest case, which might induce the drastic change in coral reef ecosystem.

3) Some topics on trial for recovering the coral reefs, decreasing biological threats, and reducing CO2 emission in Ryukyu Archipelago will be shown briefly; such as coral plantation, public construction, terrestrial soil, and new energy technology.

3. Reconstruction of coastal environments using corals and giant clams: a solution to better understand current and future climate changes

Lazareth, C.E.1; Williamson, D.1; Cabioch, G.1; Le Cornec, F.1; Caquineau, S.1; Mandeng-Yogo, M. 1; Olago, D.2

1 IPSL/LOCEAN, UPMC/CNRS/IRD/MNHN, Centre IRD France Nord, 32 avenue Henri Varagnat, 93143 Bondy CEDEX, France
2 Department of Geology, University of Nairobi, PO Box 30197-00100, Nairobi, Kenya

The study of the climatic variability of the Tropics for certain key periods of the past is essential to better understand current, and future, climate dynamics. One of these key periods is the last interglacial period (LIG = Last Inter Glacial), between ~130-118 ka BP, also named MIS 5 (Marine Isotopic Stage) or Eemien. Indeed, this climatic period is characterized, on a global scale, by sea level and temperatures higher than the current one. This period is thus potentially representative of our future climate and a better knowledge of the climate of this time, and of its variability, is thus of paramount importance to improve the climate models and their predictions; and this more especially over small tropical islands particularly sensitive to the various impacts of climate change.

The climatic variability in the west-tropical Indian Ocean is dominated, on a seasonal scale, by the Asiatic monsoon; while on the inter-annual scale a strong bond exists with the El Niño Southern Oscillation. Paleoenvironmental records in this area could thus provide crucial information on the regional scale, but also on the global scale (Indian Ocean - Pacific Ocean teleconnection). One of the archives abundantly used to reconstruct oceanographic conditions (e.g. SST, productivity, upwelling occurrences) of the past are corals. These records can be supplemented by those obtained from another biocarbonates alive in the same ecosystem: giant clams. In fact, these molluscs have very dense shell (i.e., well preserved in the course of time) and can live several tens of years. By combining data obtained thus from two similar archives, results can be interpreted with a higher confidence.

A better knowledge of past mean regional climate and past regional climate variability, potentially at the seasonal scale, is crucial to help set up benchmarks for modern changes and to improve future model simulations.

4. Climate Change: Sea-level Rise, Earthquakes and Volcanic Eruption and their impacts to Small Island States; the Lessons for Zanzibar

Ahmada H. Khatib
The State University of Zanzibar, Tanzania

Zanzibar is one of the small islands of the Indian Ocean. Lying a long the tropics it is characterized by high temperatures, limited resources, low attitude (below sea-level) and its position makes it more vulnerable to natural hazards while these hazards are common in most small islands recently signs are eminent for Zanzibar to be caught up in the same condition. For example, the effect of the tsunamis of the Banda Ache Indonesia of the 2004 was felt even here, distance of thousands of kilometers. In addition lying on the African plate and close to the East African Rift Valley, active volcanoes and with increasing global warming the chance of being affected is ever increasing. This paper therefore is an attempt to explore all possibilities of being caught unprepared and so finds out the relationship that exist between the climate change on one hand and the sea-level rise, earthquakes and volcanic eruption on the other and to draw some lesson from over the world.

The paper examined the Zanzibar population growth of over a period of 20 years, climate indicators, the current impacts of the melting of major ice caps as causing isocratic imbalances and the sea-level rise, the fluctuating world temperatures as causes of the increasing emission of the green house gases, magma injection from mantle as increasing plate tectonic movements, earthquake occurrence and volcanic eruptions. The paper uses documentary method studying the data that is available, analysis of the previous researches by prominent scientists, examination of the deliberations of international organizations responsible for the monitoring of the climate change and media coverage on the subject matter The results show a direct as well indirect correlation between the climate change and the increasing restlessness of the planet earth where small islands states are most vulnerable ecosystems with more frequent earthquakes, volcanic eruptions Equally increasing of temperatures speeding biological activities and so emission of the green house gases. The rising sea-level endangers the existence of some low –lying islands Monitoring , predictions and adaptation methods have been drawn as lesson for Zanzibar. In conclusion and in considering the fact that in Zanzibar despite the approval of the Disaster Management Act. No. 20 of 2006 and nothing has been put into practice the paper suggests some alert warning system as practical method to disseminate the information towards the forthcoming dangers, improvement of Disaster Management Unit, Enactment of Laws and Regulations, public awareness campaigns, strengthening disaster management training, and launching of the disaster relief fund.

5. Why don't people always respond to perceived climate change? Thinking about the limits and barriers to climate change adaptation in coastal areas and Small Island States

Sheona Shackleton

Department of Environmental Science, Rhodes University, Grahamstown, South Africa

Climate change is a reality and adaptation a necessity not a choice, and this applies nowhere more so than amongst small island states and coastal areas. But why, even when climate change is perceived and experienced, are we largely failing to respond?The dominant discourse in climate change adaptation suggests that with the right technology, determined efforts to enhance adaptive capacity amongst the vulnerable, and sufficient funding to carry out programmes on the ground, adaptation will be possible and will happen. But this is not always the case. There is increasing evidence that there are many serious hurdles to adaptation and that people do not always respond in the ways expected making it difficult to move from anticipating adaptation to actual adaptation. The 'barriers and limits' discourse and framework provides a systematic way to explore the variety of intersecting social, environmental and economic factors that may prevent or hamper society, governments, communities and individuals adapting to perceived and future unknown climate variability and change. The approach recognises adaptation as a complex process involving multiple linked strategies at several scales rather than a series of planned technical interventions. The best technical solutions may be ignored or even rejected if there are cognitive, cultural and social barriers to taking these up. In other situations, there may

physical, economic and political limits to what is possible and thus adaptation may need to involve a process of transformation or require particular forms of state support in the form of social protection. In this paper, I provide some conceptualisation of these ideas in the context of small island states and suggest how research using such an approach may be constructive in helping to understand how climate change adaptation at different levels can be best supported and promoted.

6. Impacts of Climate Change on Coastal Resources-Challenges for Socio-economic Development

Pius Yanda
Institute of Resource Assessment & and Mwalimu Julius
University of Dar Es salaam, Tanzania
E-mail: yanda@ira.udsm.ac.tz; pyanda@gmail.com

Abstract
Climate change is now a reality. The world has warmed by 0.76° Celsius since pre-industrial times. Rainfall pattern and intensity has changed. Extreme events (droughts and floods) have been enhanced. There is evidence of sea level rise through ice melting and thermal expansion. Most small islands are highly vulnerable to climate change. Sea level rise is causing beach erosion and degradation of coastal areas. Likewise, acidification and sea surface temperature are affecting marine biodiversity such as bleaching of coral reefs. But also, sea level threatens tourism industry through damage to tourism infrastructure and loss of property which would consequently reduce the potential economic benefits of tourism, due to reduced tourist arrivals. Sea level is projected to rise between the present and the end of the century by 0.2 - 0.6m at the rate of 3.6 mm per year. This will have further effects on ecosystems (e.g. coral reef bleaching).
Key words: Climate change, sea level rise, erosion, coral bleaching

PROGRAM

1st International symposium on impacts , vulnerability, and adaptation to Climate Change in Small Island Developing States; *implications to poverty reduction*

December 12-14, 2011, Zanzibar

Day one, Monday December 12, 2011

TIME	EVENT	VENUE
07:30-9:30	**REGISTRATION**	Bahari Hall
9:30-10:40	Opening Ceremony • *Chairman of the Organizing Committee* • *Representative, DFID* • *Vice Chancellor of State University Of Zanzibar* • *Minister, MoVET of Zanzibar* • *Guest of Honor* • *Group Photo*	Bahari Hall
10:40-11:25	TEA BREAK	Bahari Hall
11:25-12:10	**Plenary Lecture** *The Economics of Climate Change in Zanzibar* **Paul Watkiss** Director of Economics for GCAP, Visiting senior Researcher, University of Oxford, UK	Bahari Hall
12:10-12:55	**Plenary Lecture** *Climate Change: Sea-level Rise, Earthquakes and Volcanic Eruption and their impacts to Small Island States, the Lessons for Zanzibar* **Ahmada Khatib** Senior Lecturer, physical oceanography, The State University of Zanzibar-SUZA	Bahari Hall

12:55-14:00	LUNCH BREAK	**Vero Restaurant**
TIME	Bahari Hall **Session 1** ***Climate change and Biodiversity***	Thabit Kombo Hall
14:00-14:25	*Can Mangroves With stand Impacts of Climate Change?* **Mohamed Omar Said[1], [3, 4,] James Gatundu Kairo3, Nico Koedam[2], Farid Dahdouh-Guebas[1]** 1Biocomplexity, Nature Management and Genetic Differentiation Teams: 2 Laboratory of General Botany and Nature Maagement, Mangrove Management Group, Vrije Universiteit Brussel, Pleinlaan 2, B-1050 Brussel, Belgium: 3Kenyan Marine and Fisheries Research Institute, P.O. Box 81651, Mombasa, Kenya: 4Kenya Wildlife Service, P.O. Box 82144, Mombasa, Kenya	*Climate Change and Health Information System: A case of Ministry of Health Zanzibar.* **Abubakar Bakar, Rashid Khamis, Maryam Khamis, Mwanajuma Mgeni.** University Putra Malaysia,Ministry of Health, The State University of Zanzibar(SUZA),SUZA
14:25-14:50	*Reconstructing 7000 years of sea level and mangrove dynamics on Zanzibar* **Rob Marchant, Paramita Punwongand Katherine Selby** York Institute of Tropical Ecosystem Dynamics, Environment Department, University of York, YO10 5DD, UK	*Climatic Change, Food Security And Malnutrition In Zanzibar* **RASHID K. KHAMIS** Ministry of Health, Zanzibar
14:50-15:15	*Reduced Emission from Deforrestation and Degradation (REDD), as a tool for environmental conservation, sustainable socio-economic development, and its environmental policy implications among the poor nations.* **Joel N Ongaro** Bergen Community College, USA	*Climate Change Adaption in the Indian Himalayan: Developing Sustainable Strategies for Water Resources* **Ravinder N. Batta** Rural Development in the Government of Himachal Pradesh, India

15:15-15:40	*Priorities for implementing adaptation to climate change impacts in coastal zones of Tanzania* **Robert Katikiro[1,2*], Edison Macus[3], Jairos Mahenge[4], Duncan Rusule[5]** Leibniz- Centre for Marine Tropical Ecology (ZMT) GmbH, Fahrenheitstrasse 6, 28359 Bremen. Germany,Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP), P.O.Box 845 Mtwara,Phycology Laboratory 1, Institute of Biological Sciences, University of the Philippines Los Baños, College Laguna 4031, Philippines,Tanzania Coastal and Management Partnership (TCMP)-Bagamoyo Office, P.O.Box 71686 Dar es salaam.,Ministry of Energy and Minerals. Dar es salaam	
15:40-16:50	Coffee Break	Bahari Hall
16:50-17:50	Poster Mini-Symposium, Themes 1,2,3	Bahari Hall
19:30-21:30	Welcome Dinner and Zanzibar culture…	**Vero Restaurant**

Day two

December Tuesday 13, 2011

Bahari Hall

09:00-09:30	Participant Arrival/Registration
09:30-10:15	Plenary Lecture *Response of coral reef to global warming and ocean acidification and possible drastic change* **Tamotsu Oomori.** Professor Emeritus, Department of Chemistry, Biology and Marine Sciences, University of the Ryukyus, 1-Nishihara, Okinawa 903-0213, JAPAN
10:15-11:00	Plenary Lecture *Reconstruction of coastal environments using corals and giant clams: a solution to better understand current and future climate changes* **Lazareth, C.E.[1]; Williamson, D.[1]; Cabioch, G.[1]; Le Cornec, F.[1]; Caquineau, S.[1]; Mandeng-Yogo, M. [1]; Olago, D.[2]**

	1/ IPSL/LOCEAN, UPMC/CNRS/IRD/MNHN, Centre IRD France Nord, 32 avenue Henri Varagnat, 93143 Bondy CEDEX, France 2/ Department of Geology, University of Nairobi, PO Box 30197-00100, Nairobi, Kenya	
11:00-11:20	Tea Break	
	Bahari Hall	Thabit Kombo Hall
11:20-11:40	*Shoreline dynamics along the eastern coast of Unguja* **Y.W. Shaghude[1], N.S. Jiddawi[1], N Nyandwi1, T. Babu[2] and S Mazzilli[3]** 1 – Institute of Marine Sciences, University of Dar es Salaam, 2- Physical Oceanography,NIO, Dona Paula,Goa 403004, India and 3 – 1 Rue Miollis, 75732 Paris Cedex 15, France	*The effect of salt water intrusion to the people's livelihoods in the coastal area of Zanzibar*. **Islam S. Salim, Sheha M. Juma and Makame Haji** Department of Environment Zanzibar
11:40-12:05	*Seagrasses in a changing climate: potential effects on coastal and offshore island environments* **Lina Mtwana Nordlund[1, 2], Martin Gullström [3,4], Hans Linderholm [5,] Mats Björk[6]** 1 Chumbe Island Coral Park, Tanzania, P.O. Box 3203 - Zanzibar / Tanzania ARONIA Coastal Zone Research Team, Åbo Academy University & Novia University ofApplied Sciences, FI-106 00 Ekenäs, Finland Department of Systems Ecology, Stockholm University, SE-106 91 Stockholm, Sweden Department of Marine Ecology – Kristineberg,University of Gothenburg, SE-451 78 Fiskebäckskil, Sweden Regional Climate Group, Department of Earth Sciences, University of Gothenburg, SE-405 30 Gothenburg,Sweden6 Botany Department, Stockholm University, SE-106 91 Stockholm, Sweden.	*Climate Change Governance in Zanzibar - The need for Autonomy* **Kelly Horton.** 227 Humphries Road, Frankston, Victoria, Australia, 3199
12:05-12:30	*Control of plankton dynamics and fish recruitment by climate variation : example of Corsica, a Mediterranean island* **Anne GOFFART and Jean-Henri HECQ** University of Liège, allée de la Chime, 3 B6C B 4000 Liège Belgium & STARESO BP 33 F 20260 Calvi Corsica France	*Impacts Of Climate Change On Water And Pasture Resulting In Cross-Border Conflicts: A Case Study Of Turkana and Pokot Pastoralists Of Northwestern Kenya* **Victor Savatia** Igad Climate Prediction And Application Centre
12:30-14:00	**Lunch Break**	**Vero Restaurant**
	Bahari Hall	
14:00-14:45	Plenary Lecture *Impacts of Climate Change on Coastal Resources-Challenges for Socio-economic*	

	Development **Yanda Pius** Director, Institute of Resource Assessment, University of Dar es Salaam, Tanzania	
	Bahari Hall	Thabit Kombo Hall
14:45-15:10	*Climate vulnerability assessment and adaptation along the Ruvu River Basin Agricultural Community: A Case of Kitonga Village in Bagamoyo District, Tanzania* **Jairos Mahenge[1], Wilbard Mkama and Donald Robadue[2]** 1Tanzania Coastal Management Partnership. 2Coastal Resources Center, University of Rhode Island, Narragansett, Rhode Island 02882, USA.	*Climate Change and Development on the Porous Boundaries of â€˜Island Mwanga, in Kilimanjaro Region, Mainland Tanzania.* **Adolfo Mascarenhas & Ben Wisner et.al.** LINKS Trust Fund, University College London
15:10-15:35	*Biodiversity and ecosystem functions in a tropical wetland system* **Paimpillil Sebastian Joseph** Center for Earth Research and Environment Management, K.K. Road, Cochin 17, India.	*Impacts of climate changes on wetlands and coastal environments in Zanzibar* **M. Sheikh[1], M. Suleiman[2], Z. Khamis[1], Raja[2], T. Sinan i [2], Amour Bakar[2]** 1The State University of Zanzibar (SUZA) 2 CARE International Tanzania
15:35-16:00	*Coral reef monitoring in Tanzania: Has it been useful?* **Christopher A. Muhando** Institute of Marine Sciences, University of Dar es Salaam	*Does Climate change impacting eco-tourism?* **Lina Mtwana Nordlund & Sophia C. Masuka** 1 Chumbe Island Coral Park, 2 ARONIA Coastal Zone Research Team, Åbo Akademi University & Novia University of Applied Sciences, Finland,
16:00-16:25	*Fresh water security and climate change and variability in the Zanzibar coral rag zones* **Omar Makame** The State University of Zanzibar	*Adaptation strategies of Coastal Communities Dependent on Coastal Panaeid Shrimp Fisheries to Impact s of Climate Change and Variability in Coastal Region, Tanzania* **Kahitira M. Bwire, Afred N.N. Muzuka and Narriman Jiddawi** Institute of Marine Sciences, University of Dar es salaam
	Bahari Hall	
16:25-16:45	Coffee break	
16:45-17:45	Poster Mini-Symposium, Themes 4,5,6	Bahari Hall

Day three

Wednesday, December 14, 2011

	Bahari hall		
8:30-09:00	Registration	Reception	
09:00-09:45	Plenary Lecture: *Why don't people always respond to perceived climate change? Thinking about the limits and barriers to climate change adaptation in coastal areas and Small Island States* **Sheona Shackleton**, Department of Environmental Science, Rhodes University, Grahamstown, South Africa.		
	Bahari Hall	Mkungu Restaurant	Thabit Kombo
09:45-10:10	*Climate change, fisheries production and food security in Tanzania: Heading to a gloomy future?* **Robert Katikiro, Edison Macus, Jairos Mahenge, Duncan Rusule** 1 Leibniz Centre for Marine Tropical Ecology (ZMT) GmbH, Fahrenheitstrasse 6, D - 28359 Bremen 2 Mnazi-Bay Ruvuma Estuary Marine Park, P.O.Box 845 Mtwara, 3. Phycology Laboratory 1, Institute of Biological Sciences, University of the Philippines Los Baños, College Laguna 4031, Philippines, 4 Tanzania Coastal and Management Partnership (TCMP), P.O.Box Bagamoyo, 5Ministry of Energy and Minerals, P.O. Box Dar es salaam	*Examining the relationships between climate change, farming systems and food security: the case of kyela and Zanzibar* **Magreth S. Bushesha and Salim O. Hamad** The Open University of Tanzania	*GIS fingerprints of seawater rise around the coastal areas of Zanzibar.* **M. Sheikh[1], M. Suleiman[1], Z. Khamis[1], Raja[2], T. Sinani[2], Amour Bakar[2]** 1The State University of Zanzibar (SUZA) 2 CARE International, Tanzania

10:10-10:35	*Climate Change and its Impacts on Agriculture and Food Security in Semiarid Tanzania* **Richard Y.M. Kangalawe** Institute of Resource Assessment, University of Dar es salaam	*Climate change impacts on mangrove resources in Micheweni and Ngezi-Vumawimbi forest reserve* **Haji Massoud Hamad[1,2], Islam Salum Seif [3], Mariam I. Hamisi[1]** 1 School of social science, University of Dodoma (UDOM), P.o.Box 259, Dodoma 2 Ministry of education and vocational training P.O.Box 131, Chake-Pemba. 3The first vice President's office, Department of environment, P.O.Box 2808 Zanzibar, Tanzania 4 College of Natural and Mathematical Sciences, The University of Dodoma (UDOM), P. O. Box 338, Dodoma, Tanzania	*Using new media to communicate climate change to the youths* **George Okore** News From Africa
10:35-11:00	*Climate Variability and Crop Production in Uganda Climate change: An onslaught on the Tana Delta, biodiversity and agriculture* **Francis M. Mwaura & Geofrey Okoboi** Economic Policy Research Centre, Makerere University, P.O. Box 7841 Kampala, Uganda	*Factoring In Scale and Knowledge In The Context of Climate Change and Poverty Reduction.* **Adolfo Mascarenhas & Harun Makandi** COSTECH TANZANIA, LINKS Trust	*Vulnerability to the effects of climate change and adaptation: the case of ebro delta* **Sandra Fatoric** Autonomous University of Barcelona, Department of Geography, Building B, Campus UAB, 08193 Bellaterra (Cerdanyola de Vallès), Spain
11:00-11:25	*Biotechnology for climate change adaptation and mitigation: Improved agricultural productivity and food security* **Godliving Y. S. Mtui** Department of Molecular Biology and Biotechnology, University of Dar es Salaam, P.O. Box 35179, Dar es Salaam, Tanzania.	*Local perspectives on the relationships between Climate Change and Tourism in Unguja Island* **Godwin A. Lema;Huruma Sigalla; Richard R. Sambaiga; Emanuel Shemagembe** Geography Department, University of Dar es Salaam Sociology Department, University of Dar es Salaam	*Factors influencing households adoption of clean cooking energy in Uganda* **Francis Mwaura and Geofrey Okoboi** Economic Policy Research Centre,
11:25-11:50	Tea Break	Bahari Hall	

11:50-12:00	Vote of thanks	Bahari Hall
12:00-13:00	Closing ceremony	Bahari Hall
13:00-14:00	Lunch	**Vero Restaurant**
14:00-17:00	Excursion	JOZANI National Park

POSTERS

P1	*Edible Orchids of Makete district the Southern Highlands of Tanzania: Diversity, Edibility, Conservation and Implications* **Lourance Njopilai David Mapunda & William Crispo Hamisy** National Plant Genetic Resources Center.
P2	*Climate Change and implications on Ecosystem Services, Biodiversity and Local Livelihoods in Southern Tanzania* **Richard Y.M. Kangalawe** Institute of Resource Assessment, University of Dar es Salaam
P3	*The influence of climate change on shoreline dynamics along the northwestern coast of Unguja* **Y.W. Shaghude[1] and A.M. Dubi[2]** 1- Institute of Marine Sciences, University of Dar es Salaam, P.O. Box 668, Zanzibar,2- Nelson Mandela African Institute of Science and Technology P.O. Box 447, Arusha.
P4	*Climate Change, Land use and Food security* **Nuwagaba** Uganda Christian University.
P5	*Spatial and Temporal Distribution of Rice Yellow mottle virus vectors in farmers fields in Kilombero District, Morogoro Tanzania* **B. J. Tesha[1,2], G. M. Rwegasira[2] and P.J. Njau[2]** 1Tropical Pesticide Research Institute, P.O.BOX 3024, Arusha, Tanzania; 2 Department of Crop Science and Production, Sokoine University of Agriculture, P.O.BOX 3005 Chuo Kikuu, Morogoro, Tanzania.
P6	*Climate Change Institutional arrangement in Zanzibar; a paradox equation!* **M. Sheikh[1], Raja[2], T. Sinani[2], Amour Bakar[2] , Abdalla Hamad Bakari[1]** 1The State University of Zanzibar (SUZA),2 CARE International

P7	*Climate Change and Socio-economic aspect of South East Marine Protected Area in Rodrigues Island Republic of Mauritius* **Allen Vosrie Cedras** United Nations Development Programme (UNDP)
P8	*Beach Management Units and Their effectiveness in Managing Fisheries Resources in Lake Victoria, Tanzania* **Nyangubho Nyega** Ideal Consulting Group (T) Limited
P9	*Social-Economic impact of Climate Change a pre-requisite for adaptation strategies* **Lazaro Mngumi** IRA-University of Dar es Salaam
P10	*Climate Change and Environmental Education* **[1]Sophia Masuka, [2] Lina Nordlund** Chumbe Island Coral Park
P11	*Assessing Policies Promoting Poverty Alleviation and Marine Resource Sustainability in Impoverished Coastal Communities* **Michelle Stern** Trinity College Dublin, Canada
P12	*Impacts of global warming to the growth rate of commercial seaweeds around Zanzibar* **M. Sheikh, Mmanga H. Mmanga & Remtula** The State University of Zanzibar
P13	*Use of indigenous knowledge in mitigating and adaptation of the Impacts of Climate change in Zanzibar* **Hassan, I. H** The State University of Zanzibar.

ORAL SESSION

Oral Theme 1: Climate change and Biodiversity

Reconstructing 7000 years of sea level and mangrove dynamics on Zanzibar

Rob Marchant, Paramita Punwongand Katherine Selby

York Institute of Tropical Ecosystem Dynamics, Environment Department, University of York, YO10 5DD, UK

Abstract

Holocene mangrove dynamics from six cores located across a two transect on the West Coast of Zanzibar, Tanzania were established from pollen, sediment and radiocarbon analyses. Cores were collected from Makobre and Unguja Ukuu and both represent a record of the mangrove community for the past 8000 years. Both sites show clear evidence of a mid Holocene high sea level stand relative to the present day. After about 5000 years ago mangrove communities retreated probably due to a lower sea level and drier environment conditions. There was less frequency of inundation, possibly due to a lower sea level, after 1230 cal BP. There were some fluctuations between mangroves, back-mangrove and terrestrial grasses until before 825 cal BP. Marked vegetation changes occurred after circa 800 cal yr BP probably relate to sea level regression and a dessication phase during the late Holocene record. This trend continues through to the present day documenting an increase human settlement in this area. The recent decrease of mangrove, particularly Rhizophora suggests less inundation by saline water and a lower sea level and probably due to anthropogenic activities during the recent decades. The reoccurrence of the mangrove assemblage at the top of the cores suggests a period of recent sea level rise to the present day. The research is currently working development with a team of archaeologists to investigate the past cultural-environmental-ecosystem at Unguja Ukuu, the former capital of Zanzibar, over the last few millennia

Priorities for implementing adaptation to climate change impacts in coastal zones of Tanzania

Robert Katikiro1,2, Edison Macus3, Jairos Mahenge4, Duncan Rusule5 Leibniz- Centre for Marine Tropical Ecology (ZMT) GmbH, Fahrenheitstrasse 6, 28359 Bremen. Germany,Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP), P.O.Box 845 Mtwara,Phycology Laboratory 1, Institute of Biological Sciences, University of the Philippines Los Baños, College Laguna 4031, Philippines, Tanzania Coastal and Management Partnership (TCMP)-Bagamoyo Office, P.O.Box 71686 Dar es salaam.,Ministry of Energy and Minerals. Dar es salaam*

Abstract

Climate change effects such as sea level rise, sea temperatures and extreme weather events are known to have significant implications to coastal environments and ecosystems including low-lying coastal plains, beaches, islands, coastal wetlands, coral reefs, mangroves and estuaries. Climate impacts also pose potential threats to other sectors such as fisheries and aquaculture, tourism, transportation, agriculture, and infrastructure found within coastal zones. Many developing countries including Tanzania are not adequately prepared to adapt to the current climate change impacts. This paper presents an overview of national priorities for adaptation to climate change in coastal zones of Tanzania based on information collected through rapid assessment which involved deskwork review on approaches and issues for climate change impacts and adaptation, interviews and discussion with climate change stakeholders as well as those dealing with coastal management, policy

making, meteorology, environmental management programmes and civil society organizations in Tanzania. We uncovered that much concerns exist to tackle climate change problems and various adaptation strategies have been identified and implemented in some areas. However, actions on climate change issues at sectorial levels are quite limited, as compared to the ways the climate change impacts are unfolding, and Tanzania lacks clear mechanism to translate and promulgate adaptation approaches to communities coupled with absence of national priorities and action plan for adaptation to climate change in coastal zones (and other sectors). The NAPA though not yet fully implemented has not given much attention to the coastal zones.

Our findings emphasis on the need to adapt and not wait and see and argue for urgently formulation of national priorities and national plan of action on adaptation to climate change in coastal areas with focus on addressing capacity gaps, raise awareness on climate impacts, information sharing and coordination and mobilization of knowledge for adaptation policy and planning. It is also important to mainstream climate change adaptation within existing policies and practices that inform integrated coastal management.

Climate vulnerability assessment and adaptation along the Ruvu River Basin Agricultural Community: A Case of Kitonga Village in Bagamoyo District, Tanzania

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Abstract

Climate change impacts have been evident in most communities in Tanzania and different sectoral assets including agriculture are also facing vulnerability challenges. Kitonga village, situated along the Ruvu River basin within Bagamoyo District, is a prime example of a community dominated by agricultural activities that is acting now to face these climate change impacts. The patterns of agricultural productivity of this village have been noticeably affected by climate change as revealed by a community based vulnerability assessment carried out using a Participatory Rural Appraisal approach combined with the guidance of the USAID document "Adapting to Coastal Climate Change: A Guidebook for Development Planners".

The village established a twelve member climate change committee comprised in equal numbers of men and women. It is considering the needs of people involved with other economic activities aside from farming. The committee was responsible for documenting impacts and implementing realistic adaptation options. The vulnerability assessment revealed that Kitonga is exposed to severe floods, drought and unpredictable rainfall in different years that adversely affected agricultural yield, hence exposing the village to severe famine.

The adaptation planning discussions led to the idea of more effectively utilizing less flooded-affected areas is the village is taking direct action to implement this by planting fruit trees particularly mangoes that apart from being used in carbon sink will provide income and nutrition to the community. The planning work of the Kitonga committee went further by stressing the need for improving water retention techniques in rice paddies. The committee was provided some assistance to start with the implementation of mango trees planting.

It acquired a demonstration farm of approximately 24 acres (9.6 hectares) for planting about 1,680 trees. Mango trees in less flooded areas are viewed by the villagers as both a mitigation and adaptation option. As a new economic activity, the adaptation measures are helping show how the resilience of an agricultural community can be improved, thus reducing its vulnerability to climate change.

Reduced emission from deforestation and degradation (REDD), as a tool for environmental conservation, sustainable socio-economic development, and its environmental policy implications among the poor nations.

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Abstract

In this paper, the author will highlight and attempt to refine the understanding of some ,often confusing ,concepts such as: climate change, global warming, biodiversity and the recent concept of "REDD".

The author largely endeavors to address, not only the history, relevance and the applicability of REDD as a potential conservation tool among the developing countries, but he also appreciates the limitations and challenges of conceptualizing and exploiting the benefits and costs of REDD. Besides analyzing the viability and the feasibility of implementing the REDD concept as a conservation tool,the paper will also explore the wider policy implications of REDD. This is especially true in the aspects of incorporating the environment in the socio-economic improvement of people's livelihoods in the poor countries of the world, where a nearby forest is almost the only lifeline.

Oral Theme 2: Climate Change and Ecosystem Services

Shoreline dynamics along the eastern coast of Unguja

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Abstract

Assessment of the magnitude and rates of shoreline changes at 15 villages, along the eastern coast of Unguja Island stretching between Jambiani and Paje was investigated using GIS support tools, involving the analyses of three sets of aerial photo imageries (1977, 1989 and 2004). Modeling approach was used to investigate the causative factors of the observed shoreline changes. The mitigation measures being used were documented, classified and mapped using hand held GPS and GIS support tools. The analyses of the time series data of aerial photo imageries revealed that magnitude and rates of shoreline changes along the investigated coastal stretch varied from one village to another, but with most of the villages indicating negative changes (i.e. eroding) and with very few sites showing either accreting or no changes. The most alarming magnitude and rates of erosion were observed on the southern coastal stretch (Jambiani villages) relative to the northern villages (Page villages). The information on the shoreline dynamics (erosion/accretion) was confirmed by the local communities during a one day stake holder's meeting. Simulation of monthly tidal current velocities revealed that the tidal currents varied from shore to offshore (with strongest currents out of the fringing reefs), from north to south (with strongest currents on the northern part of the coastal stretch) and

from one month (with strongest tidal currents in March, May and June). The current speeds inside the lagoon were generally sluggish suggesting that the fringing reefs play a significant role in protecting the shore. The wave regimes along the investigated coastal stretch seem to be controlled by the sea bottom topography and the wind fetch and the major differences between the northern and southern lagoon account for the observed major differences between the magnitude and rates of erosion between the northern and southern coastal sections. The northern lagoon which is characterized by shallower sea bottom topography and shorter wind fetch was relatively calmer compared with the southern lagoon which is characterized deeper sea bottom topography, a number of depressions and longer wind fetch. Mitigation measures being applied included masonry seawalls, erected poles, shore stabilizing plants, quarried rock boulders and a combination thereof. The observed shoreline changes along the investigated coastal stretch; especially the coastal erosion is largely attributed to the natural factors, namely the tidal currents and the wind generated waves. However, there were some human factors (bad practices) which tended to accelerate the erosion along the investigated coastal stretch and also there were some human factors (good practices) which tended to reverse the action of erosion along the investigated coastal stretch. Awareness campaigns to promote good human practices and discourage bad human practices on shore management are recommended as part of the future shore management strategy.

Seagrasses in a changing climate: potential effects on coastal and offshore island environments

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Abstract

Sea grass meadows occupy shallow coastal areas all over the world and are one of the most important biotopes owing to their high productivity and critical function for thousands of animal and plant species that enrich biodiversity. In East Africa, extensive sea grass meadows provide the ecological basis for fisheries production, in turn supporting huge numbers of inhabitants with necessary protein for their livelihood and survival. Though, in East Africa, as in numerous regions across the globe, sea grasses are under progressive decline due to anthropogenic activities. Among the many threats to sea grasses, those related to climate change are certainly the most complex and difficult to understand. Here, we identify and compare potential threats and effects of climate change to sea grass in coastal and offshore island environments by focusing on impacts related to rising sea levels, changing tidal regimes, UV radiation damage, sediment hypoxia and anoxia, increases in sea temperatures and increased storm and flooding events. In addition, we give a general idea of the complexity of climate change by highlighting examples where climate change in an intricate way may interact with other disturbances as well as general geochemical, physical and biological processes, subsequently affecting the regulation of sea grass distribution. To face potential future threats of climate change and to support resilience of sea grass habitats in East African islands, a major focus should be to ensure high water quality, favorable water movement, good sediment conditions, genetic variability and pathways of connectivity. This requires pro-active and effective management efforts at local, national and regional institutional levels.

Control of plankton dynamics and fish recruitment by climate variation : example of Corsica, a Mediterranean island

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Abstract

In coastal areas of temperate and tropical small islands, most exploited fish species have undergone large reductions in stock size over the last decades. This impact is believed to be due, in large measure, to overfishing. However, in some cases, the poor recruitment of young fish or crustaceans of commercial interest is related to climate change. Here we present results acquired from three decades in Corsica, a small Mediterranean island where water quality is unbiased by terrestrial inputs and local activities. We show how plankton dynamics and fish recruitment are controlled by climate variation.

Long-term changes of surface plankton dynamics are studied from 1979 at a permanent station in the oligotrophic Bay of Calvi (Corsica, Mediterranean Sea). As a distinctive feature of the area, the plankton bloom is characterized by a very large interannual variability reaching one order of magnitude from one year to another. Studies conducted to understand mechanisms controlling plankton variability emphasize a close relationship between climate variation (mainly winter wind stress intensity), water temperature and phytoplankton biomass. Shifts in phytoplankton community structure contribute to control the dynamics of zooplankton that rely on phytoplankton as food and influence the temporal succession of zooplankton assemblages. Changes in the timing, the biomass and the composition of the zooplankton communities result in a mismatch with the presence of the main food source of the small fish and alter recruitment success. The Corsican example could help to be aware of the potential consequences that changes in plankton dynamics controlled by climate variation will pose to coastal fishermen of small islands.

Can Mangroves With stand Impacts of Climate Change?

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Abstract

Mangroves are occupants of a harsh intertidal environment and are subjected to daily tidal fluctuations in temperature, water and salt exposure, and varying degrees of hypoxia, necessitating a high degree of adaptations with relevant tolerance ranges. Additionally, they are often increasingly proximate to rapidly growing human settlements. However, the nature of vegetation structure, regeneration and productivty under an intense socio-economic paradigm in a peri-urban setting, serve to confirm this assertive, adaptive, and resilience of mangrove ecosystems. These adaptations catalyse responses to diverse and pervasive changes over time, ensuring survival in spatial and temporal scales. However, a limit, „a breaking point□ or a threshold exists,

around which shifts in forest structure and function are imminent. This causes spatial and temporal variability in species composition, regeneration capacity, nutritive quality of productivity material and variable recovery and growth rates after perturbations. The prospects of system collapse is often imminent should the disturbance frequency and intensity persist or multiply over spatial and temporal scales. These limits pose special challenges and opprotunities to the survival of mangroves under different scenarios of climate change.

Biodiversity and ecosystem functions in a tropical wetland system

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Abstract

The Vembanad wetlands (Cochin Backwaters) of south India foster high bio-diversity and the environmental condition of this lake is steadily declining due to climate and various human activities. The ecosystem services and resources are subject to various biophysical processes. The process of commercialization of estuarine space has drawn limits to their capabilities and degraded the biodiversity of this eco- zone. The biodiversity degradation is also related to the weak political and social mobilizations of communities to tackle their problems. Apart from a variety of hydro-biophysical processes, biodiversity is degraded due to various social and economic processes internal to the system and external interventions found to accelerate the process of degradation. The recent studies indicated that the ecosystem is retaining its average health expressed through the existence of a diverse floral and faunal composition. There were 150 fish and shellfish species available during early eighties, 74 migrant species and 17 vagrant species. About 43 (species were available for 12 months, 42 species for a period of six to 10 months, 25 species for three to six months and the remaining were available for one or two months. Biodiversity loss had reduced the quantity of fish landed. Prior to the commissioning of the Thaneermukkom bund, an average daily catch of 5 tones of shrimp was available in summer months. Production has been decreasing during the past 3 decades. The productivity of backwater had reduced from 1131 kg/ha in 1950's to the range of 300- 400 kg/ha during the eighties. A survey of fish in the backwaters in 2009 had shown that several fish species that believed to have left the tourist hotspots have returned to the backwaters, whose biodiversity is under threat for various reasons and identified 10 more fish species. One major reason for the slow degradation is that many consider it to be of little or no value. It is important to value these resources and formulate policies in such a way that every stakeholder pays the relevant price for using the resources and environment. Although the system is still capable of generating new economic values, creation of the new values is at the expense of the biodiversity of backwaters, which in turn would threaten the sustainable existence of the traditional communities. The scenario is likely to worsen if proper environmental governance is not undertaken with people's participation. The depletion of biodiversity accelerates rural poverty, especially among the marginalized and weaker sections of the population.

Coral reef monitoring in Tanzania: Has it been useful?

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Abstract

Coral reef monitoring in Tanzania started in early 1990s. The main objective was to assess the extent of damage caused by the use of destructive resource harvesting practices, mainly dynamite and dragged nets. The derived information formed the basis for setting up of legislation (control) measures and monitoring of further changes on reef healthy. Two systems evolved: low take (skin diving) community based coral reef

monitoring and high tech involving the use of Self Contained Underwater Breathing Apparatus (SCUBA). Coral reef monitoring has contributed substantial descriptive information and has raised awareness to coastal communities and managers. Analysis of CRM data over the years has provided information on the dynamics of reef health conditions, e.g. cover and composition of reef benthos, fish and macro-invertebrates. Statistical Power Analysis tests both on spatial and temporal scale showed inadequate coral monitoring sampling effort, mainly due to high variance of categories being measured. Furthermore, the ongoing monitoring programs did not include environmental or economic indicator variables, hence, monitoring results were not linked or statistically analysed against possible causative factors. Lack of information on biological connectivity and vital replenishment factors, e.g., larval sources, dispersal mechanisms, growth, and survival also diluted the interpretation of benthic community data, directly impacting on strategic management of reef fish and invertebrates. Similarly, the link between socio-economic attributes and coral monitoring results has remained weak. This paper discusses critical issues in the past coral reef monitoring programs and provides strategic recommendations for the next phase of coral reef monitoring in Tanzania.

Fresh water security and climate change and variability in the Zanzibar coral rag zones

Makame Omar Makame

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Abstract

This paper presents one part of a larger, multidimensional study on the vulnerability of Zanzibar coastal communities to climate change and other linked stressors. Specifically this paper sought to examine water security issues in relation to climate change and other linked stressors. Water security was conceptualized to be composed of three principal components: water availability, accessibility and the quality of the available water. Findings show that water from wells is a major source of household water since tap water supply is often erratic. Farming systems are completely rain-fed while in some parts livestock owners use caves as the main source of water for their animals. Water quality is a major challenge along the coast as the majority of wells and coral caves in the study sites contain hard water with varying intensities of salinity. Factors such as water supply infrastructure, settlement structure, poverty, competition for water, geology and geomorphologic structure, variability in supply and poor water resource management are all adversely interact with global climate change and local variability events such as sea level rise salt water incursion and drought to intensify water insecurity along the Zanzibar coast. Communities employ a variety of coping strategies such as reducing consumption by, for example, decreasing shower frequency. The study also found that the impact of water insecurity are disproportionate within communities; women are more vulnerable as they are responsible for fetching water for household needs often from great distances or from deep wells. In response to this, several policy options are considered ranging from the supply side such as rain water harvesting and full utilisation of coral cave water to the demand side such as awareness raising on the scarcity of water and suggesting ways to conserve water.

Oral Theme 3: Climate Change, Agriculture and Food Security

Climate change, fisheries production and food security in Tanzania: Heading to a gloomy future?

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Abstract
The role of fisheries sector in enhancing food security through its food, cash income, livelihoods, and economic growth and safety net functions to the majority of coastal and riparian communities in Tanzania is astounding. Fisheries supply over 35% of the total animal protein consumed by the population, with the annual per capita consumption of about 10kg and over 90% of fish is delivered from small-scale fisheries. The sector employs about 5% of the available workforce in the country and contributes about 5-7% to the GDP. Conversely, the benefits are threatened by a rapid population growth, leading to a gap in the fish needed for food security and the supply available from fisheries. Tanzanian government has taken various initiatives to make the benefits of fisheries in the country especially underutilized and unexploited species to cope with population demand and economic development in view of attaining millennium development goal of reducing hunger and poverty. However, climate change, which has been projected to affect fish stocks and fishing activities hence, affecting fish distribution, abundance, and productivity, and fishing operations including fishing gears, vessels and fishing villages and communities, could derail any of such plans and strategies. In this article, we intend to expound on the important role of fisheries in addressing food security in a changing climate. Our main argument is on whether developing countries like Tanzania, which are devastated by a plethora of socio-economic problems, could be able to achieve anything like a 30-50% in animal protein from fisheries resources whereas majority of its capture fisheries have been declining even without climate change impacts, and have observed a marginal progress in aquaculture production. We are optimistic that fisheries in Tanzania would ensure food security even in a changing climate if appropriate policy interventions that address adaptation to climate change and development of coping strategies including alternative livelihoods are in place. The government needs to embark on adaptation measures which contribute to the reduction of food insecurity and poverty.

Climate Change and its Impacts on Agriculture and Food Security in Semiarid Tanzania

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Abstract
Climate change is a global challenge to both sustainable livelihoods and economic development. In Tanzania, agriculture is the backbone of the economy and depends almost entirely on rainfall, which makes agriculture and food security particularly vulnerable to climate change. This paper analyses the impacts of climate change

and variability on agricultural production, food security and existing adaptive capacities in the semiarid areas of Tanzania. Focus is also placed on the overall impacts on rural livelihoods. The data for which the paper is based was collected using a combination of focus group discussions, key informant interviews, household surveys and field observations. Findings from the study indicate that communities understood climate change in terms of changing temperature patterns, variability in rainfall patterns and amount, wind, water availability, increased incidences of drought and decreased agricultural productivity. Communities in the study area acknowledged that while rainfall amounts have decreased considerably over the last twenty to thirty years, while temperatures have increased. This local understanding of changing conditions is also supported by meteorological data. Agricultural productivity was reported to have declined, mainly due to prolonged drought, inadequate and uneven distribution of rainfall, and unpredictable onset and ending of rains as well as shifts in seasonality. The changing conditions have variably affected agricultural production and food security in the area. Communities have responded to the changing conditions by developing multiple adaptation strategies including growing of drought tolerant and early maturing crop varieties, increasing wetlands cultivation and livestock keeping. The paper argues that for ensured agricultural production and food security diversification of adaptive strategies, such as water harvesting for small-scale irrigation, integration of livestock and crop production, and non-farm activities are crucial and have to be promoted for sustainable rural livelihood in a changing climate.

Climate Variability and Crop Production in Uganda Climate change: An onslaught on the Tana Delta, biodiversity and agriculture

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Abstract
In this paper, the relationship between climate variation and crop output in Uganda for the period 1981 to 2008 is examined. The time-varying ARCH model of the crop production function is used to estimate the relationships. Analysis of the incidence of rainfall and temperature variation from the long-term average indicates that it is insignificant. Estimates of the trend of rainfall and temperature suggest a gradual decline in volume of rainfall and record of temperatures in Uganda in the present and near future. ARCH model estimates show that a positive variation in rainfall and temperature has a positive influence of crop output, while exponential increase in rainfall has detrimental effect. Also, results confirm that extensive farming -through increase in area cultivated rather than intensive farming (through use of improved technologies) remains the predominant form of increasing agricultural output in Uganda. Policy recommendations suggested in this paper among others include (i) government to support farmers to adopt small-scale irrigation systems; and (ii) strengthen of capacity of weather forecast agencies to monitor and educate the public on present and potential near-future climate variations.

Biotechnology for climate change adaptation and mitigation: Improved agricultural productivity and food security

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Abstract
In the context of climate change adaptation and mitigation, biotechnology can respond positively towards reducing vulnerability of natural and human systems to climate change effects. This paper assesses different approaches in which both conventional and modern biotechnology can be used to address climate change

adaptation and mitigation for improved crops adaptability, productivity and food security, while at the same time contributing to the reduction of the greenhouse gases. The current challenges and future perspectives of biotechnologies for climate change adaptation and mitigation are highlighted. Conventional agricultural biotechnologies such as no-till practices, use of biofertilizers, tissue culture and breeding for adaptive varieties are among feasible options that could positively address the potential negative effects of climate change and thereby contributing to carbon sequestration initiatives. Adopting environmentally friendly agricultural practices such as application of energy-efficient farming technologies; reduced use of artificial fertilizers and use of renewable energy in crop production will result to reduced emission of carbon dioxide and other greenhouse gases. On the other hand, the adoption of modern biotechnology through the use of genetically modified stress-tolerant, energy-efficient and high-yielding transgenic crop plants also stand to substantially counter the negative effects of climate change. Safe application of biotechnology will greatly complement other on-going measures being taken to improve agricultural productivity and food security. It is suggested that an integrated approach - combining both conventional and modern agricultural biotechnologies will significantly contribute to the current and future worldwide climate change adaptation and mitigation efforts.

Oral Theme 4: Climate Change, Land Use and Forestry

Examining the relationships between climate change, farming systems and food security: the case of kyela and Zanzibar

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Abstract

This paper discusses the interrelationships between climate change, farming systems and food security in Tanzania. The paper borrows largely from a field study conducted in Kyela district and in Zanzibar South. Focus Group Discussions, Interviews with key informants and observations were the key approaches used in data collection. Thematic data analysis was used to analyze the collected data. Rainfall records for Kyela district for the period 19610 2006 were analyzed to assess climate behavior in Kyela. The paper demonstrates that Kyela has been experiencing inter-annual variations and inter-decadal variability and fluctuations in rainfall and in patterns of extreme metrological events, particularly floods. Such variability in rainfall pattern and metrological events has led to changes in farming systems among small holder farmers in the two study areas. The paper reveals that the farmers cultivate less and less those crops they perceive less resistant to extreme weather (in most cases annual food crops) while at the same time adopt crops that they perceive to be less vulnerable to climate change (mostly perennial traditional cash crops). In Kyela most farmers are shifting into cultivating more cocoa for cash arguing that most annual food crops are vulnerable to the on-going climate variability. In Zanzibar south, people are abandoning the farming of food crops and moved to the farming of open beach algae to respond to climate variability and fluctuations. The paper questions the sustainability of the responses to climate variability by the communities studied particularly in issues related to food security. This is particularly because studies elsewhere have indicated that with the on-going changes in global climate, farmers are optimizing the growing of food crops to ensure availability of food in their households. The paper suggests further research in the area of responses to climate variability and change in ensuring food security in Tanzania as a whole.

GIS fingerprints of seawater rise around the coastal areas of Zanzibar.

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Abstract
Small islands communities contribute the least to the problem of global climate change mainly emission of green house gases, it is evidently that they are among the most vulnerable to its adverse effects sea-level rise and beach erosion in particular.
The aim of this study was to investigate sea level rise and predicting possible impacts around coastal environments around Zanzibar Islands. GPS data was collected using Garmin GPS and WGS 1984 geographic coordinate system. Various strategies were used to collect information in the field. Position of physical features present on site like ruins, tree trunks, graves were collected by taking GPS coordinate on the spot. Positions of features that no longer exist but were there in the past were marked by following description of the old men, they pointed the areas and coordinates were taken eg. Fresh water spring, graves and high water mark levels. GPS coordinates taken in the field were used with the aerial photographs of Unguja and Pemba. Shape files for Unguja and Pemba islands, at Shehia level, were used to identify the study areas. i.e Msuka, Mbale island, Tumbe, Kisiwa Panza, Ng'ombeni and Makoongwe island (for Pemba), and Michamvi (for Unguja). The discrepancies of the shapefiles were corrected with the help of aerial photographs. The GPS points were transformed to geographic data points (point shapefiles), so that, the data can be used for geographical analysis of the phenomenon; as well as, the geographical representation of the phenomenon through maps. This study provides a comprehensive evidence of shifting of high water mark coastal areas such as found at Msuka Pemba. The existing watermarks were compared with several previous decades ~1940s. The study reveals that seawater level has been risen at an unprecedented rate. There is an urgent need for the relevant Authorities to act appropriately in order to conserve the Isles coastal ecosystems and accompanied vital resources.

Climate change impacts on mangrove resources in Micheweni and Ngezi-Vumawimbi Nature forest reserve.

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Abstract
The global climate change poses significant threat to the welfare of mangrove resources along with other coastal resources. This study assessed the impacts on mangrove resources of Micheweni and Ngezi-Vumawimbi Nature forest reserve based on three climate change parameters which are sea-level rise, temperature and precipitation. Study also investigated which adaptations and mitigation measures have been taken to cope

with those impacts. The study revealed that sea-level rise has not yet impacted the mangroves resources in both sites. However, gradual sea level rise in recent years poses significant threat to the mangroves resources in near future if the rising trend will exceed the limit of which mangroves resources can cope. In addition to that meteorological data showed that there is no significant change in temperature in addition to the rainfall pattern in recent years and therefore these parameters have also not impacted the mangrove resources in both mangrove forests. Nevertheless, the rising trend in temperature coupled with shortage of rainfall if persists in next decades, they will obviously damage the mangrove resources to a considerable extent. Further more, despite the fact that most of the villagers (80%) are aware of climate change impacts mangrove re-plantation, protection and regeneration are the only existing mitigation and adaptation measures to cope with climate change impacts on mangroves. As such more efforts is needed to improve management for resilience of mangroves, allowing local community to play a vital role in shaping up management plans, develop alternative income generation and also preparing the community to adapt to climate change impacts.

Factoring In Scale and Knowledge In The Context of Climate Change and Poverty Reduction.

Adolfo Mascarenhas & Harun Makandi

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Abstract

The convenience of the annual cyclical climate features, the trade winds, had in many ways considerably influenced the past development of Zanzibar. While the trade winds continue to blow and now hardly used; other factors have now shaped development in Zanzibar independent of the winds. In recent decades, since Climate Change has taken global prominence, there has been a plethora of generalized almost doctrinal positions to address the related issues of impact, vulnerability and adaptation. Africa as a region has been most subjected to preconceived notions based on predictive, scientific models and solutions that fit all situations. Contextually, there has been little integration of other factors which profoundly exacerbate or offer other options for the emergence of livelihoods. Research work undertaken in Zanzibar offers a microcosm for a much more relevant approach to factor in scale, local and contextual knowledge to address real social and economic issue pertaining to priorities in addressing poverty and development issues.

To begin with, the present and great variations in weather and climate pattern, is not the first and probably not the last "climate change" that people will experience. Concurrently with these climatic change episodes there were profound social, institutional and economic changes. Basically, there are just too many glib answers when many basic questions remain answered. For instance, Zanzibar and Pemba are among the wettest areas in East Africa so what causes the rainfall pattern in Zanzibar, Tanzania and other countries to fluctuate? Are we overlooking some factors and what type of additional knowledge is needed? Have we paid enough attention to sunspots, temperature and current movements in the southern Indian Ocean? What can be done about this neglect or should we continue with the present refrain on CC?. Detailed research carried out NE Unguja, in Dole and Kiwange village, shed light on the need to develop a better understanding of steps needed to tangibly address "climate change" and poverty challenges.

Climate Change, Industry,Settlement and Society

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Development forum for habitat Kathmandu, Nepal

Abstract:
Political transition in three different phases - after the end of Rana autocracy in 1951, restoration of multiparty system in 1990 and Maoist's arm struggle from 1996 and the people's movement ending of royal autocracy and peace agreement with Maoist in 2006 - on the one hand, and natural disasters causing loss of properties and homes, environmental degradation and low socioeconomic development in the rural region, on the other hand, including adaptation of the centralised policy have attracted huge population migration into the Kathmandu valley for better income opportunity, education, health, safety and other services thereby causing 6.6% annual urban population growth (against the national average of 2.1%) and accommodating about 30.9% total national urban population in the valley. It was observed that the average temperature in Nepal is rising by 0.50 C per decade and the precipitation trend below 1500m level is increasing. Failure to regulate such rapid urbanisation has caused haphazard urban growth, reducing the agricultural and greenery open spaces, environment degradation and ecological unbalance due to conversion of wetlands and forest into urban land use, ground water pumping thereby reducing the water table and creating the urban heat islands and so on. Due to unpredictable monsoon rain and its distribution and amount together with increase in temperature has reduced crops yields and livestock numbers. In addition to these, there has been increased in vector borne (skin diseases, viral encephalitis) and water borne (diarrhoeal, typhoid) diseases in the valley. Glacial Lakes outburst in Himalayan region will cause flooding in the valley. As the urban infrastructures including buildings are old and unplanned growth, they can not resist the impact of climate change.

In the past, the cultural practice in the form of daily rituals, celebration of various festivals and community's social norms and religious beliefs including 'guthi system' was able to manage the urban growth and sustain the towns of the Kathmandu valley for many centuries during the' lichchhavi' and 'malla' periods. Discontinuation of the past cultural practice and failure to adapt modern planned development has caused the haphazard urban growth and disintegration of community participation in local development works. Combination of both 'top down' approach for formulation of policies and programs of integration of climate change adaption, disaster reduction into the development works by identifying the risk and 'bottom up' strategy to raise public awareness on climate change and to adapt the lifestyles accordingly is essential.

Local perspectives on the relationships between Climate Change and Tourism in Unguja Island

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Abstract:
While the vulnerability of tourism to climate change is overemphasized at global, regional and national climate change adaptation agenda (www.suzasymposium2011.go.tz; Palosuo, 2009; Dubois, 2006), coastal communities at local settings in Tanzania seldom contemplate this as a problem. What seem as topical issues to the latter relates to optimal benefits along with negative implications of tourism to their livelihood. This paper, therefore, seek to explore and explain local perspectives on the nature of tourism in Unguja, Zanzibar and whether climate change is considered as a threat to it as well as its implications on sustainable livelihood. The study employed in-depth interviews, focus group discussion and literature reviews to capture local narratives and discourses.

Interviews were tape recorded and transcribed to ensure novelty of the findings. On the other hand, observation and photographs enabled capturing landscape features, tourism investment and livelihoods activities in selected study sites. In addition to the qualitative data, structured questionnaires were administered to the respondents toward the end of the study to capture quantitative data for selected variables. At the end of the study, major research findings were presented at the meeting with the local communities. This allows community feedbacks, potential intervention and reliability of the findings which is the essence of participatory action research.

It is concluded that although tourism in Unguja Island is technically assumed to be more vulnerable from impacts of climate change, sea-level rise and beach erosion, local people currently have quite a different world outlook that tourism stakeholders should prioritize equitable tourism benefits to the poor along with addressing its negative implications to their livelihood. Climate change is more or less a very remote priority as of now. This implies that climate change adaptation stakeholders should embrace local perspectives in redefining what climate change adaptation entails to the poor among the coastal community particularly in areas overwhelmed by tourism induced impoverishment.

Oral Theme 5: Climate Change, Human Health and Water Supply

Climatic Change, Food Security And Malnutrition In Zanzibar

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Ministry of Health, Zanzibar

Abstract

Zanzibar rely its food security from three major sources namely – (i) Locally harvested food available in Zanzibar (ii) Locally imported food from Mainland and (iii) Imported food from abroad. Evidence has shown the influence of climatic change on the former two sources of food security in Zanzibar. Crops of cereal types depending on rains at the time of planting have been subjected to excessive rains that take away the fertile soil with the planted seeds and displaced it outside the farming area. Excessive rains and blowing winds have been said to take away the yellowish pollen responsible to make the content of the rice when it start to fertilize and has been also detrimental to other food crops like cassava and sweet-yams.

Long terms of drought have been the leading climatic hazards resulting in severe food shortages in different parts of Africa including Zanzibar. This condition has been the course of hunger, shortages of grass for animal feeding and drinking water. Excessive long drought seasons have affected biodiversity both flora and fauna. Deforestation as one of the courses of drought has been identified to be increasing despite state denouncements and interventions. Global warming has been responsible for huge and aggressive climatic change including the notorious Elnyino rains, hurricanes and long periods of droughts. The interest of this paper is to document the relationship of food security as influenced by climatic change in Zanzibar and the eventual condition of food scarcity that may effects nutritional intake and subsequently escalate morbidity conditions amongst Zanzibar population.

Climate change: its impacts on health; need for intervention.

Adinan Juma

Kilimanjaro Christian Medical Center (KCMC)

Abstract
Climate Change affects health of the population concerned either directly or indirectly, looking at the environment as an integral part of the human health. There is growing evidence that changes in the global climate will have profound effects on the health and well-being of citizens in countries throughout the world, the global burden of diseases have increased by 25%, WHO estimates around 150,000 deaths now occur in low-income countries each year due to climate change from four climate-sensitive health outcomes – crop failure and malnutrition, diarrheal disease, malaria and flooding, almost 85% of these deaths are in young children, further more by 2050, due to climate change, 210 million Africans will be starving. Non communicable diseases are also increasing as carbon gases deplete ozone layer, and increase global temperature, skin cancer as a result of direct contact with ultraviolet light is expected to rise. The effect of climate change is unequally suffered, 88% of the disease burden attributable to climate change afflicts children under age 5. While greenhouse gases (in developed countries) producers are rich, have well equipped health facilities and sophisticated infrastructures the populations at greatest risk are those living in small island developing states, mountainous regions, water-stressed areas, megacities and coastal areas in developing countries and also poor people and those lacking access to health services. The Climate Change crisis can be tackled if there is global responsibility, political will, financial commitment, and public-private partnership for country-led and country-specific interventions that seek solutions beyond calamities caused by climate change.

Climate Change and Health Information System: A case of Ministry of Health Zanzibar

Abubakar Bakar[1], Rashid Khamis[2], Maryam Khamis[3],

Mwanajuma Mgeni[3].

1 University Putra Malaysia, 2Ministry of Health, Zanzibar,
3. The State University of Zanzibar(SUZA)

Abstract
Climate change has exposed human health into terrifying effects and biggest threats of diseases. That calls for expertise and unwavering actions against it to avoid intensification of ecological disease circulation such as malaria and related problems across human generations worldwide. The study on Health Information System Technology and human health was conducted in Zanzibar Island. Zanzibar is located in tropical area with equatorial climate which is affected with heavy rain at the beginning of the year, hurricane and even draught due to the hot weather at the end of year. These natural and other climatic changes made by human interaction to environment expose Zanzibar to high risk of tropical diseases. Health information system is used as a tool to supports information sharing among a large community of different users with different needs within and outside the healthcare organization. The system has proved to be important in locating the prevalence of the diseases to more and less affected area. The information conveyed help the government to make decision about certain diseases or disaster that may arise in case of climate change. The study revealed that planning, monitoring and evaluation are the core activities to combat hazardous consequences of climate change in the attempts to improve human health care systems. Therefore, the role of Health Information System upon the presence of the aforementioned key activities remains indisputable as far as the subject of fighting effects of climate change while improving human health care deliveries is concerned.

Climate Change Adaption in the Indian Himalayan:

Developing Sustainable Strategies for Water Resources

Ravinder N. Batta

Rural Development in the Government of Himachal Pradesh, India

Abstract

Although understanding of the impact of climate change continues to improve, it is yet difficult to project and identify the specific regional impacts with any precision. The uncertainty remains a key constraint and major challenge, both in formulation and implementing policies related to adaptation. Climate change represents a loss of information; the value of historical data in guiding water resources decision making is degraded and future conditions are subject to a high level of uncertainty. With the very high variations of topography and rainfall, prediction of future climate trends will be especially difficult for Himachal Pradesh. It is evident that farmers are already feeling the impact of climate change. Observed parameters include movement of apple orchards to higher altitudes, loss of various tree species, drying of traditional water sources, change in bird types and population, reduction in crop yields, and increased vulnerability of winter cropping due to changes in rainfall patterns and planting dates.

The mountain ecosystems harbor a wide range of natural resources and are particularly sensitive to change. Regional changes in climate have already affected many physical and biological systems in the mountains. Analysis of temperature trends in the Himalayas and vicinity shows that temperature increases are greater in the uplands than the lowlands. Climate change impacts on water resources will likely include: increased frequency of precipitation; increase in extreme rainfall intensity; increased variability of rainfall patterns; increased likelihood of water shortages; reduced levels of precipitation as snow; loss of glaciers volumes; earlier snow melt and increased temperature. The broad objective of the study is to develop a climate change adaptation- focused sustainable water resource strategy and appropriate framework for Himachal Pradesh. Adaptation in this context is an ongoing and flexible process designed to reduce the exposure of society to risks arising from climate variability.

The strategy identifies and presents a broad framework for integrated water resources planning and management to increase the level of resilience to climate change. It is based on an assessment of the status of water resources in the state, including the present and planned water utilization examined within the framework of environment, conservation and sustainability. The strategy also examines the present institutional arrangements for water resources management and assesses the requirements for institutional development, strengthening and necessary reform measures to support the development of robust and sustainable water resources management.

The outcome of the study is the seven point strategic framework for water resources adaptation by setting out an approach and strategies required for achieving long term sustainable water resources management and adaptation to climate change. It is proposed to apply IWRM as a management tool since it would open up important opportunities to position water, as a resource at the centre of the policy making arena an important facility to initiate proactive actions to increase the resilience of water resource systems to climate change. The framework has been so designed that takes into consideration the national action plan for climate change.

Oral Theme 6: Climate Change and Socio-Economy

The effect of salt water intrusion to the people's livelihoods in the coastal area of Zanzibar

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Department of Environment Zanzibar

Abstract
The Zanzibar coastal zone is rich in natural resources, whereas the environment plays a significant role in the economy. The main economic activities focuses on the exploitation of these natural resources are farming, fishing and tourism, and depend majorly on the functional integrity of the coastal ecosystem. Therefore, as these resources are exploited by different sectors; there are signs of decline in natural resources and biodiversity, reduction the area of mangroves and coastal forests, resulting by declining yields of crops and fishes. This environmental change is considered as attributed by unsustainable use of coastal resources as well as global climate change. The sea level rise as climate change results along the vulnerability of the coastal communities threatens their socio-economic development and livelihoods. Therefore, this study tries to outline some of the potential impacts that include land losses, coastal erosion and damage to coastal structure and properties, loss of coastal habitats, saline intrusion and inundation of coastal areas. The key findings of this assessment conducted by the Department of Environment provide a clear picture on the status of environmental change of the coastal areas and its implication to the communities' livelihoods. The study conducted at four (4) selected coastal villages of Unguja and Pemba namely Jambiani and Nungwi; Kisiwa Panza and Tumbe. Different methods were employed for the study, which include consultation with key stakeholders, focus group discussion, literature review, site visit and physical observation.

Impacts Of Climate Change On Water And Pasture Resulting In Cross-Border Conflicts:

A Case Study Of Turkana and Pokot Pastoralists Of Northwestern Kenya.

Victor Savatia

IGAD Climate Prediction And Application Centre

Abstract.
Northwestern Kenya is purely an ASAL (Arid and semi-arid land) region. The mean annual maximum temperature is 430C while the mean minimum annual temperature is 140C. The mean annual rainfall is 230mm. Nomadic pastoralism is the major economic activity in the area and it accounts for 60-70% of all livestock in Kenya. Pastoralism accounts for 90% of the employment and 95% of the family incomes and livelihood security in the region. However, frequent droughts occasioned by climate change have threatened this important sector which offers a viable production system in the vast drylands of the country. Consequently, an important question that needs to be addressed is how has the pressure over scarce resources consequent to climatic change led to conflict in the area? And what have been the patterns over the years? Against this background, this work focuses on investigating the chain of interactions between climate change and conflicts over water and pasture. This paper assesses both rainfall and conflicts patterns over Northwestern Kenya and the relationship between raids and rainfall in the region. Both graphical and correlation analysis were used in this study. Model outputs from four Global Climate Models (GCMs) and Precis Regional model were also evaluated.

Climate Change and Development on the Porous Boundaries of Island Mwanga, in Kilimanjaro Region, Mainland Tanzania.

Adolfo Mascarenhas & Ben Wisner et.al.

LINKS Trust Fund, University College London

Abstract:
In his interpretation of 'Island Africa', Jonathan Kingdon delves into the evolution of Africa's rare animals and plants. A similar approach has been taken to interpret the social evolution of an equally intricate contemporary human ecology of livelihoods in Mwanga District in Tanzania. This paper is based on findings from a research project on climate change undertaken by a consortium of universities from the USA and Tanzania. The choice of the approach is purposeful. The Northern Pare Mountains part of the Eastern Arc, remnant of a highland, is so endowed with biodiversity that it is a global hotspot. The mountains and the expansive outliers dip into the Pangani Valley on the east.. Mwanga District incorporating both these landscapes is also home to more than a quarter million people belonging to several different communities. Remarkably, the impact of climate change, adaptation and development have ben approached with a mixture of local and modern sciences and a pragmatic approach to socioeconomic realities. The land and people of the ancient Northern Pare Mountains provide a microcosm of the evolution of communities almost symbiotically adapting to climate as well as to other changes. The landscape is shaped by a very long interplay of the geologic and climatic upheavals going back to the Pre-Cambrian age. In contrast, the socioeconomic aspects have experienced rapid changes pertaining to, population, land and natural resource uses and with these the configuration of decision making. It is in this context that functional knowledge gives some indication of alternatives to adaptation beyond theories. The major lessons to learn in terms of planning for climate change and poverty reduction is the way in which the porous boundaries between physical and mental space have evolved as a mechanism for poverty reduction, including endogenous contribution for continuity and survival. The transfer of natural resources, the social and economic adaptation gives a better picture why community involvement is so essential for a sustainable feature.

Impacts of climate changes on wetlands and coastal environments in Zanzibar

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2 CARE International Tanzania

Abstract:
The impacts of climate change on wetlands and sea level rise on coastal fronts have been investigated on several villages around Unguja and Pemba islands. Structured questionnaires were used to extract information from the knowledgeable personnel regarding changes on wetlands, sea level rise and other climate change problems including the socioeconomic impacts involved. The investigation shows that wetland disappearance caused by climate change is a prominent feature around visited areas. Wetland disappearance is accompanied with loss of biodiversity; specifically birds and water lily are the most affected fauna and flora.

Marine ecosystems are very sensitive to climate change; episodes of elevated SST are common in the past few decades. Coral reefs are very vulnerable to increased SST and have suffered significantly to the frequent occurrences of higher SST causing bleaching and potential death like the 1998 massive coral mortality. Sea level rise has caused extensive damage mostly on coastal areas and small islets, shorefront buildings and vegetation have been eroded and historic sites like cemetery and farm lands have been encroached and converted into intertidal areas. Rice pads can no longer support rice production due to sea water intrusion and some freshwater wells have changed into salty and their electro-conductivity increased to the level of

threatening human health. Elevated temperatures have also caused the increase of water borne diseases like cholera, diarrhoea and conjunctivitis. Socioeconomic impact of climate change and wetland loss include the loss of cultivation land especially rice, extended draught and high temperature have increased diseases to crops like millet and cassava. Potentially commercial fruits like mango are invaded by insects. Similarly, fishing grounds have changed forcing the fishermen to go fishing far in the open ocean. The activities; farming and fishing are the two important income generating practices. Impacts on farming and fishing have caused direct implication on livelihood of people especially the elders of both sexes.

Impacts of Climate Change on Coastal Tourism:

A Case of Bagamoyo District, Tanzania

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2 Institute of Resource Assessment, University of Dar es salaam

Abstract
Tourism is one of the fastest growing sectors of the economy in Tanzania and for the last few decades the sector has shown a positive growth and contributed significantly to nature conservation, economic development and reduction of poverty in rural and remote areas where it is carried out. However, climate change place tourism at risk, particularly in coastal zones and mountain regions. Climate change is one of the main global issues of the 21st century, and will severely affect the world at various levels. Globally, climate change and sea level rise together will expose many coasts to increasing risks, including coastal erosion and inundation. Although scientific evidence is still lacking, it is probable that destruction of tourist infrastructures such as hotels, recreational facilities, beach erosion, flood risks and water-pollution-related diseases in low-lying coastal areas, as well as coral reef bleaching would impact negatively on tourism. Apparently, the coastal areas of Bagamoyo District have become an important area for tourist activities. The main attractions in Bagamoyo coastal areas include cultural and natural attractions, ranging from wildlife, white sandy beaches, mangrove forests, geological formations, or other natural resources that could be of interest to tourists. Cultural tourist attractions include historical and archaeological sites such as Kaole ruins.

Other attractions include man made features such as magnificent beach hotels and other structures established for tourism purposes which contribute significantly to the national economy. This paper assesses the impacts of climate change on coastal tourism along the coast of Bagamoyo. It identifies impacts on coastal resources that are used as tourist attractions, and assesses the vulnerability of coastal tourism and how it is adapting to climate change impacts. Trend analysis of rainfall shows that annual rainfall had generally decreased since 1950s, while temperatures have generally increased. Findings also show that there have been changes in shoreline over the years as evidenced by the disappearance of indigenous vegetation as well as decreasing of land size as a result of coastal erosion. Furthermore, the paper examines the existing policies that are addressing mitigation and adaptation to climate change in Tanzania.

Climate change impacting eco-tourism?

Lina Mtwana Nordlund[1,2] & Sophia C. Masuka[1]

1 Chumbe Island Coral Park,
2 ARONIA Coastal Zone Research Team, Åbo Akademi
University & Novia University of Applied Sciences, Finland,

Abstract:
The tourism industry often relies on the natural environment as an attraction, and especially so for eco-tourism as it refers to responsible travel to natural areas that conserves the environment and improves the well-being of local people. Chumbe Island Coral Park, Ltd. (CHICOP), established in 1991 as a private company with non-profit objectives, is a unique example of successful Marine Protected Area management through income generation from eco-tourism, supporting conservation efforts for both marine and terrestrial ecosystems, park management and the environmental education program.

Chumbe Island is a small island facing potential threats from climate change and one of the biggest challenges is to anticipate how the island ecosystems will be affected, the extent of reduced environmental quality, and how the potential negative effects may be reduced or avoided. In the literature one can often read about problems such as warmer oceans, raised sea levels and acidification causing bleaching and death of coral reefs, which is a worrying perspective, considering that corals are the most important tourist attraction for Chumbe Island. Furthermore, the possible impact of climate change on the business must also be foreseen. Such impacts can include cancellations due to extreme weather, or deterioration of attractions, and the need for more infrastructure maintenance?

Additionally, wave damage and coastal erosion can threaten facilities and constructions, saltwater can enter groundwater and fresh water reservoirs, and changes in rain patterns may reduce possible operating seasons for business. If business income is affected, the well-being of employees, and communities' dependant on tourism related activities on the island will be affected. Therefore, there is an urgent need to identify how the negative effects of climate change can be minimized, while maintaining high environmental quality. One suggestion is to generally improve the protection of the environment all over Zanzibar by e.g. advocating eco-tourism, as better environmental protection will likely increase overall resilience. Furthermore, efforts in educating people should be increased, starting with things that are most relevant to them.

Climate Change Governance in Zanzibar - The need for Autonomy

Kelly Horton.

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Abstract
The Zanzibar Islands are increasingly vulnerable to the impacts of climate change, many of which have already begun to be experienced. Despite the acknowledgement of a need for swift and meaningful action on climate change in Zanzibar, this has proved slow and inefficient as a result of structural challenges within the Tanzanian National and Zanzibar Governments. Mainland Tanzania's submissions to the UNFCCC under the National Adaptation Program of Action (NAPA) have not effectively addressed the Zanzibar specific impacts and island-appropriate adaptation strategies, leaving a gaping hole in climate policy and a neglect of the citizens of Zanzibar.

To overcome this, a re-designed framework of climate change governance and environmental autonomy is needed to ensure the most positive outcomes for the Zanzibar archipelago. The provision of enhanced autonomy for Zanzibar from the Tanzanian Government in regards to climate change adaptation would likely prove to be highly effective due to the unique challenges faced by Zanzibar. This would allow Zanzibar to pursue funding and support from the UNFCCC for adaptation and mitigation to climate change, as well as to focus upon successful models of adaptation and mitigation from other Small Island Developing States, namely the strategies outlined in the Mauritius Strategy. A new framework for Climate Change governance would allow Zanzibar to hold a significantly stronger position in tackling the complex challenges posed by climate change. Without this, Zanzibar is at greater risk of falling further behind its SIDS neighbors, and will face an uncertain future for both people and environment.

Oral Theme 7: Climate Change Mitigation

Vulnerability to the effects of climate change and adaptation: the case of ebro delta

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Abstract:
The Ebro Delta and the population it supports are facing an extremely uncertain future. Most of deltas are subjected to a considerable amount of human impacts, therefore the integrity of the coastal territory is at risk. Moreover, the climate change is widely recognised as serious threat especially to Mediterranean region. Increased erosion, decreased sediment discharge leading to coastal retreat, intensification of floods, saltwater intrusion, decline in economic activities and loss of ecosystems are of particular concern for the Ebro Delta.
The paper explores how environmental change, especially those related to climate change, presents a new threat for the community living in the Ebro Delta. Aims of this research are to identify, describe, and explain the concepts of vulnerability to climate change and options for adaptation as they are currently applied, and to attempt to clarify relationships between them. Such clarification may be achieved through fieldwork and interviews that are main objectives. Through the interviews, we attempt to indicate some paths that could be followed in order to find practical solutions and to propose possible options for climate change adaptation in order to reduce the vulnerability and enable the community to cope with climatic variability.
Results show that until now the human management (mainly construction of dams) has affected much more the delta area than the hydro-climatic factors. It can also be observed that hydro-climatic factors seem to accelerate the present trends such as coastal erosion, and salt-water intrusion in coastal areas. These may have serious consequences for agriculture production, natural resources, tourism, and industry in the future. From our research is evident that the best option available for adaptation of the Ebro Delta would be the mildest option, the one that is most in harmony with the nature, as the contribution, consolidation of sand and soil by preserving existing dunes and creating new dunes and wetlands.

Using new media to communicate climate change to the youths

George Okore

News From Africa

Abstract:
Youths form significant portion of any country population. In many African countries, this segment is two thirds of any population. Demographically referred to as the youth, this segment constitutes about two thirds of populations in many countries. Interestingly, most communication strategies have not been channeled towards this important niche. They numerical dominance comes against the background of rise of new Media and other channels of communications, which have grown in leaps and bounds over the last 15 years. In fact, internet and other web based communications are taking the center stage, throwing newspapers, radio station and televisions out of fashion. The dramatically rise of new media of communication has revolutionized the industry. Savvy, faster and efficient, the new media and channels of communications are especially popular among those below 36 years of age. In a world besieged by myriad problems and challenges, the choice on which media to use to communicate continues to baffle many. It therefore calls for the right blend or mix of both traditional and new media to communicate the challenges. This therefore means that for any communications to be effective, it must be packaged and delivered in a way those appeals to the youths.

Factors influencing households adoption of clean cooking energy in Uganda

Francis Mwaura and Geofrey Okoboi

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Abstract
Although, Uganda recognizes the critical role forests and other biomes play in carbon sequestration and resultant amelioration of climate change, high dependency on biomass has hindered efforts on reduced emissions from deforestation and forest degradation (REDD). About 97% of the population relies on biomass energy source for cooking. The per capita consumption of biomass energy has been estimated at 680 Kg/yr and 240 kg/yr for firewood and 4 kg and 120 kg for charcoal for rural and urban areas respectively. To implement the REDD protocol requirements and to ensure forests continue providing other ecosystem services, stakeholders are exploring intervention to reduce biomass overutilization. The objective of this paper was to determine factors influencing overreliance of biomass energy for cooking. The Uganda National Household Survey (UNHS) data collected in 2004 and 2005 was used. A multinomial Logit regression of socio-economic determinant of household cooking energy types showed; levels of education , age of household head, household size, household income and location (rural/urban) as the major factors influencing the choice of energy used for cooking. Household with fewer members, more income, urban based and more educated household head showed higher probability of shifting from biomass energy to cleaner energy utilization. To conserve forests, there is a need for deliberate policy intervention on shifting from biomass to cleaner energy sources. Availability and accessibility of energy sources targeted and improved welfare of the population will facilitate shift to cleaner energy sources.

Oral Theme 8: Climate Change and Fisheries

Scenario planning for improving the adaptive capacity of the fisheries sectors in Tanzania

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Abstract:
Fishers, and those communities whose livelihoods or subsistence depend on fishing, face challenges and opportunities associated with climatic changes and non-climatic stresses such as market volatility, institutions, policy, population growth and changes in technology. For long term sustainability, there is a need to change how we think about and plan for future of fisheries. Scenarios are a useful tool to explore uncertainties and understand non-climatic drivers of change however they are seldom used in fisheries. This article introduces the use of future scenarios explore the potential impacts of climate change, socio-economic changes, population growth and market forces on marine fisheries and aquaculture in coastal Tanzania up to 2050 and how those possible futures may be incorporated into the long term adaptation planning strategy. The study deployed explorative scenario development methodology and elicited information using online survey to 57 fisheries, aquaculture, climate and climatology, environmental management and socio-sciences experts in Tanzania. The

study found that experts were able to identify and analyze the multiple drivers of change facing fisheries sector in the past and explored the future ones. The experts also constructed storylines for the sector by 2050. The results showed that creative thinking and looking forward to search for emerging patterns due to drivers like climate change through scenario development could lead to identification of a range of plausible futures which may help to construct specific strategies to cope with the change. Despite the limitations of the methodology, it is anticipated that incorporating scenarios into strategic plans will help fisheries sector to anticipate and respond to change in a confident and coordinated manner and increase the adaptive capacity of the sector.
Adaptation strategies of Coastal Communities Dependent on Coastal Panaeid Shrimp

Fisheries to Impact s of Climate Change and Variability in Coastal Region, Tanzania.

Kahitira M. Bwire, Afred N.N. Muzuka and Narriman Jiddawi

Institute of Marine Sciences, University of Dar es salaam

Abstract:
The Present work, which was conducted in Bagamoyo and Rufiji Districts, Coastal region aimed at documenting adaptation strategies of coastal communities dependent on coastal panaeid shrimp fisheries to impacts of climate change and variability. The work involved collection of meteorological and river discharges data from the Tanzania Meteorological Agency and the Rufiji Basin Development Authority in Dar es Salaam, Morogoro and Rufiji offices. Interviews were also conducted through questionnaires to obtain information on indigenous knowledge on climate change adaptation strategies in the Saadani Village and kajanjo fishing camp (Bagamoyo district) and Dima and Kibanju fishing camps in Rufiji district. Collected meteorological data included monthly rainfall for bagamoyo,Dar es salaam, Pangani, Kibaha, Morogoro, Kilwa Masoko and Utete stations. In order to calculate mean rainfall, seasonal means as well as annual anomamalies for coastal areas from Tanga to Mtwara additional data from Tanga, Zanzibar and Mtwara were added. Discharge data collected from within the Rufiji basin satations were also analyzed. Generally, temperature record indicated warming while annual rainfall declined in coastal Tanzania. Rising temperature and declined in rainfall have brought decline in prawns, resources as perceived by most of coastal communities interviewed. In response to this decline, fishermen have resorted to increasing length of fishing nets, fishing other fish species or look for other alternative activities on land. Fishers perceived rainfall variation, temperature and salinity as major factors responsible for decline in the abundance of shrimps, although few acknowledged problems of over fishing.

POSTER SESSION

Poster Theme 1: Climate change and Biodiversity

Edible Orchids of Makete district the Southern Highlands of Tanzania: Diversity, Edibility, Conservation and Implications

Lourance Njopilai David Mapunda & William Crispo Hamisy

National Plant Genetic Resources Center.

Abstract
"Edible Orchids" are terrestrial plant species of the family Orchidaceae growing wildly in the Southern Highlands of Tanzania, their root tubers are dug up for consumption, The plant faces extinction threats due to overexploitation for trade, where most of tubers are exported to Zambia. The aim of this study was to establish species conservation and diversity status. Modified Whittaker plots sampling method was adopted for vegetation sampling. Six genera and 17 species were identified, 8 species as edible ones i.e.; Brachycorythis pleistophylla, Disa erubescens, D.ochrostachya , D.robusta , Eulophia chweinfurthii , Habenaria xanthochlora, Satyrium atherstonei, S.buchananii and 9 ones as non-edible. For the first time genera and species of B. pleistophylla, E. schweinfurthii are reported as edible. H. occlusa and E. schweinfurthii were observed to be rare. Observed prevalent habitat loss, degradation and fragmentation are likely to bring disturbances to Kitulo national park inhabitants. The park is relatively small 412.9 km2 making it prone to species local extinction. The practiced selective harvest of Orchids shall ultimately alter the genetic structure of the population and debilitates its survival. Harvesting of non-edible species and "male plants" worsen conservation efforts. The park scored higher diversity indices, however, more diversity was captured with increased area, suggesting for Community based conservation as a way to safeguard both rural livelihood and expand conservation area. Viable strategies to avoid species and habitat loss such as, No take zones and harvests policies like Fixed quota, Proportion and Escapement, abandoning forest plantations surrounding the park, development of alternatives and domestication of the edible Orchids species are vital.

Poster Theme 2: Climate Change and Ecosystem Services

Climate Change and implications on Ecosystem Services, Biodiversity and Local Livelihoods in Southern Tanzania

Richard Y.M. Kangalawe

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Abstract
Climate change has considerable impacts on the availability of various ecosystem services such as water. This paper presents findings from studies conducted in the southern highlands of Tanzania to assess the impacts of climate change on natural and socio-economic environments, with particular focus on water resource management and community livelihoods. Data was collected using household and key informant interviews, focus group discussions, and historical timelines. Results from these studies indicate a progressive decrease of water flows in rivers and streams, and drying-up of some wetlands. Rivers and streams have become more seasonal as compared to the past, while many natural springs have also decreased in water discharge or dried up completely. Declining amounts of rainfall, shortened rainy seasons, delayed onset of rains, increased incidences of drought and increasing temperatures are locally considered to have contributed to the observed trends. During the last few decades unreliable rainfall in upland areas due to changing climate has resulted in increased dependence on wetland cultivation. Among the consequences of dwindling water resources include

limited the agricultural productivity, deforestation, loss of biodiversity, and decreasing availability of various ecosystem services. Changes in ecosystems are likely to further affect the availability of various ecosystem services, with consequent impact on natural resources dependent livelihoods. The paper also focuses on how current practices and policies influence integrated water resources management and how that can be enhanced to ensure the sustainability of vital ecosystem services and biodiversity while also providing livelihood security to riparian communities. These calls for elaborate ecosystem management policies, strategies and practices that are adaptive to the challenges associated with changing climate

The influence of climate change on shoreline dynamics along the northwestern coast of Zanzibar

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Abstract

The influence of climate change on the shoreline dynamics along the northwestern coast of Unguja Island, stretching from Nungwi Mnarani to Kendwa were investigated by analyzing two sets of aerial photo imageries (1989 and 2004) together with the wind data from the Zanzibar meteorological station. Analyses of the topographic maps and the 2004 aerial photo imagery revealed that the coastal stretch between the northern parts of La Gemma Hotel and the western parts of Nungwi village was most vulnerable to the influence of the NE monsoon winds compared to the coastal stretch west of the Nungwi village or the coastal stretch south of the La Gemma Hotel. These findings were supported by field data which revealed that coastal erosion along the coastal stretch was severest along the coastal stretch between the northern part of La Gemma Hotel and the western parts of Nungwi village. Highest vulnerability to erosion along the coastal stretch between the northern part of La Gemma Hotel and the western part of Nungwi village was attributed to the absence of fringing reefs or patch reefs. Both the field survey and the interview survey indicated that the erosion of the coastal stretch between La Gemma and the western part of Nungwi village is more intense during the NE monsoon season. Analyses of the 1989 and 2004 aerial photographs showed marked changes along the coastal section south of La Gemma Hotel, showing significant procreation of the southern beach at La Gemma and Kendwa beaches and erosion of the beaches of the Bay south of Kendwa. Analyses of a 20 years wind data from the Zanzibar International Airport meteorological station revealed that the wind regime have changed significantly during the last two decades, with strongest winds during the later decade (1998-2007) than the previous one. Thus the observed erosion along the exposed open coast between La Gemma and the western parts of Nungwi village seem to have been intensified during the present decade than the decade before.

Poster Theme 3: Climate Change, Agriculture and Food Security

Climate Change, Land use and Food security

Nuwagaba

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Abstract

Global warming is likely to reduce agricultural production and increase food insecurity in the Tropics and this is attributed to climate change. The research was an empirical one that wanted to find out what the causes of climate change are, how land use has contributed to climate change and how these will impact on food security. The findings reveal that there is climate change as exhibited by prolonged draught, El-Niño rains and extreme temperature which have all impacted on food security negatively as extreme temperatures have

led to weevils destroying crops, change in planting seasons, making roads impassable and increased use of fertilizers. The causes of climate change have been found to be both natural and man-made, for this research emphasis was put on man- made causes and these included, increased use of plastics, increased population and urban sprawl, increased deforestation and the uncontrolled use of land through mining and extraction. The findings reveal that the way land is put to use has contributed significantly to climate change as there are activities that generate a lot of carbon gas which is responsible for climate change. The findings also revealed that climate change has no boarders and is a phenomenon which should catch the attention of everybody if it is to be averted. The method used to obtain the information was empirical as the researcher used first hand information through observation and interviewing. Limitations of the study are that it considered a portion of Uganda (Western) which may make the findings not applicable everywhere.

Spatial and Temporal Distribution of Rice Yellow mottle virus vectors in farmers fields in Kilombero District, Morogoro Tanzania

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Abstract

Rice yellow mottle virus (RYMV), an endemic disease to Africa was reported in Kenya in 1966 and thereafter in Tanzania in 1980's but with limited incidences. It spread fast and it is now omnipresent in all rice growing areas in the country. The fast spread has been partly associated with climate change that has induced increased virulence of previously less virulent viruses and rapid population buildup of their vectors. In view of the increasing incidence and the impact of RYMV on rice production in Tanzania, studies on the distribution of RYMV insect vectors were undertaken as a necessary step into designing the disease management strategies. The already documented list of known RYMV vectors in Africa was used as reference to the target species. Two sampling methods (sweep net and 4m2 quadrant) were used to assess the population of insects vectors of RYMV in the three major rice growing divisions of Kilombero District in Morogoro Tanzania (Mngeta, Ifakara and Mang'ula) rice fields. Vector found existing in the location included Chaetocnema sp. and Oxya hyla. The vectors were more abundant at the border parts of the fields than at the middle. These vectors recorded, were widely distributed of in the fields with RYMV disease incidence level of 10%-70% suggesting that they could be responsible for new infections and wide spread of RYMV disease in these areas.

Poster Theme 5: Climate Change and Socio-Economy

Climate Change and Socio-economic aspect of South East Marine Protected Area in Rodrigues Island Republic of Mauritius

Allen Vosrie Cedras

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Abstract:

The South East Marine Protected Area (SEMPA) of Rodrigues is being developed by the Rodrigues Regional Assembly with the assistance from the United Nations Development Programme and Global Environment Facility (UNDP GEF) under the MSP project 'Partnerships for Marine Protected Areas in Mauritius and Rodrigues'. The aims of the 'Partnerships for Marine Protected Areas in Mauritius and Rodrigues' project are to :

- Develop an enabling policy and institutional framework to sustainably co-manage MPAs throughout

the Republic of Mauritius

- Develop and adapt innovative co-management arrangements for Marine Protected Areas (MPAs) at a representative demonstrative site in Rodrigues.

As a mitigation of climate change impacts, the South East Marine Protected Area of Rodrigues attempts to develop a sense of ownership of the lagoon and the fishery resources within the fisher communities, through involving them in the management of the marine park. As part of this process, there is a need to reduce the human pressure (900 fishers registered, estimated to be working in the southern region) on the lagoon, while safeguarding and improving the socio-economic conditions in the area. A socio-economic study has been conducted in 2008 in order to identify baseline data of the SEMPA stakeholders' attitudes and perceptions towards the project. Three years later, it has been required a new study to develop a comprehensive assessment to analyze the socio-economic changes after gazettement of the marine park, to identify feasible and sustainable alternative livelihoods as well as measures and to facilitate a participatory action plan. The objective of the study is to provide guidelines to identify and implement income generating activities for the community of the SEMPA. This will contribute to the development of more appropriate and effective SEMPA management strategies based on a better understanding of the conditions of the communities and the possible employment opportunities to reduce the pressure in the lagoon.

Beach Management Units and Their effectiveness in Managing Fisheries Resources in Lake Victoria, Tanzania

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Abstract:
Lake Victoria wetlands are undergoing serious degradation from excessive resource harvesting, overgrazing and conversion for agriculture and industrial development, and municipal sewage disposal. The study aimed to assess the effectiveness of Beach Management Units (BMUs) as a strategy for managing the Lake Victoria fisheries resources with focus on Ilemela District. The emphasis was how BMUs have managed to reduce illegal fishing, beach pollution, degradation of fisheries resources, reduce impacts of climate change, and facilitate effective management of the lake environment. Participatory methods were used for collecting qualitative historical data, and involved key informant interviews, focus group discussions and field. Household surveys were used to collect quantitative data using a structured questionnaire.

Findings show that to a large extent BMUs have succeeded in reducing pollution of the lake by restricting washing, bathing, and damping of wastes from adjacent villages into the lake. Lake Victoria is among the most vulnerable resources to climate change. Findings revealed that the impacts related to climate change occurring in the lake basin is also compounded by various activities resulted from population influx into beach areas resulting in deforestation, land degradation, and poor water quality and quantity. Among the efforts undertaken by the BMUs is to promote the the use of traditional fisheries management approaches (e.g. Ndiba) as a sustainable way of managing fisheries resources and protection of fish breeding sites. However, some community members are still not aware of BMU functions. To ensure address the impacts of climate change in basin and to enhance the sustainability of the fisheries resources and the BMU functions, these units should be given more support, and information exchange needs to be enhanced to facilitate sharing of experiences.

Social-Economic impact of Climate Change a pre-requisite for adaptation strategies

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Abstract:
The quest of Climate Change is no more an issue of debate; its presence is well evidenced and is apparently visualized through varied social-economic aspects of people livelihoods in the Island of Zanzibar. Though the changes are gradual, they are real and often accompanied by substantial impacts to livelihoods of people and thus raising the need for tracking changes and proper documentation of the impacts thereof. This study therefore seeks to establish potential social-economic impacts of Climate Change and Variability in Small Island developing states a pivotal pre-requisite for developing appropriate adaptation strategies and/measures absence of which one can hardly devise the said adaptation measures and consequently leaving a loophole for accelerating adverse impacts instead. The study employed mainly library search as its main source of information.

Social-economic impacts of Climate Change in Zanzibar Island includes declining crop yield, declining of fish-catch, economic hardship, low income pa capita, migration of people in search of alternative livelihood means, flooding due to sea water rise and inundation of coastal infrastructure amongst others The essence of the study is not only to lay down the due foundation for developing adaptation measures against adverse impacts but is also aimed at laying the foundation for enhancing positive impacts accruing from the same.
The implication of the study to the people and their livelihoods in the Island of Zanzibar is very central. Its centrality is anchored upon the premise that social-economic structure is a due determinant of welfare of the people and the economy at large. Since Climate Change disrupts the social-economic structure in the Island, it creates the necessity of a detailed study of its impacts to the Island's economy. Thus thorough analysis of Climate Change Impacts and devising corresponding Adaptation measures will be a blessing not only to the pockets of Island's inhabitants but also the country's checks and balances and consequently pushing forward a development wheel.

Poster Theme 6: Climate Change Mitigation

Climate Change and Environmental Education

Sophia Masuka & Lina Nordlund

Chumbe Island Coral Park, Zanzibar

Abstract:
Climate change remains a challenging issue to policy makers, scientists, and communities around the world. The adverse impacts of climate change on the environment, human health, food security, human settlements, economic activities, natural resources and physical infrastructure are complex and difficult to understand, but are already noticeable in many places, including Zanzibar. In response to the impacts of climate change, there is an urgent need to increase public awareness.

Chumbe Island Coral Park (CHICOP), in Tanzania is a privately managed Marine Protected Area (MPA) with not for profit objectives aiming at managing the Chumbe Island reef sanctuary and forest reserve for conservational and educational purposes. The MPA with its conservation and education programme is fully financed by the income from an eco-lodge on the island.

CHICOP implements Education for Sustainable Development (ESD) through an Environmental Education (EE) programme to foster positive perceptions about the value of environment to the communities of Zanzibar. The education programme has since 1994 offered more than 5000 students and 800 teachers one day school

excursions to Chumbe Island free of charge. The excursions offer environmental hands on education for schoolchildren, and at the same time give teachers ideas for how to conduct field-based activities related to marine biology, forest ecology, environmental issues such as biodiversity and climate change. Along with the Education Programme for schools, CHICOP has been actively involved in other projects to increase public awareness about the need for sustainable management of precious marine and coastal resources. Thousands of community members have participated in these awareness raising activities that have increased their knowledge about nature protection and management of basic resources like water and forests. Moreover, the CHICOP EE programme is widening its coverage to include lectures and special sessions on climate change. Further, we have a group of 25 trained peer educators coming from ten villages around southern Zanzibar, who educate their fellow villagers on environmental issues including proper measures that are necessary for addressing climate change.

Climate Change Institutional arrangement in Zanzibar; a paradox equation!

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Abstract:
Zanzibar has separate institutional structures for Climate change issues from Tanzania Mainland and Zanzibar. On top of that there no nexus between the two structures. Out of these facts it is important to elucidate the existing institutional arrangements governing Climate change issues. This study aimed at analyzing institutional arrangement for climate change in Zanzibar and Tanzania as whole.

The findings show that currently the Department of Environment under the First vice president of Zanzibar is a key institution concerning to the climate change matters. It is the matter of fact that the climate change is a cross-cutting issue. Its implementation needs to strong involvement of various stake- holders; horizontal (other Governmental institutions), vertical (United Republic of Tanzania) and NGOs. The study reveals that there is a weak linkage regarding to climate change between ministerial within the RGoZ. Furthermore, the results (100%) show that there is no common platform (policy) on tackling impacts of climate change in Zanzibar. The only existing reliable document for climate change is the 1996 environmental policy. Other institutions have significant role on formulating and provide technical advice on tackling and adaptation of climate change.

The Research recommends the RGoZ to form technical committee and steering committees that will constituted with members from various related Institutions (both governmental and NGOs). These will be the top deciding organs on the matter related to climate change. There is a great need to establish clear coordinating mechanisms in coordinating and overall decision and policy making institutions with those in the Tanzania Mainland and Zanzibar. This will facilitate swift implementation of the National Climate change issues in Zanzibar.

So far, the department of environment under the Vice President of Tanzania is the focal point for all climate change issues in international arena. Members from First Vice President Office Zanzibar should be appointed to represents Zanzibar in National Climate Change Steering Committees of the Tanzania Mainland. The current situation seems Zanzibar is like an invitee to the National issues pertaining to climate change. They should be also fully involved in International negotiation Forums such as Conference of parties such as forthcoming (COP 17) and climate change related funding opportunities from donors.

Assessing Policies Promoting Poverty Alleviation and Marine Resource Sustainability in Impoverished Coastal Communities

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Abstract

There is a marked need to better understand the relationship between poverty alleviation and environmental sustainability since impoverished communities are often dependent upon their natural habitat to meet basic needs. While previous studies have recognized the challenges of integrating the dual goals of marine resource sustainability and poverty alleviation in coastal communities, greater research is needed to assess the impacts of South African policies in achieving these objectives at a time when polices are changing and the effects of climate change are increasingly evident. This research study highlights this interconnectivity on a micro scale by assessing the challenges in South Africa to reduce poverty for coastal inhabitants while simultaneously seeking sustainability of the marine resources. Since 1994, which marked the end of apartheid in South Africa, the government

has attempted to include previously disadvantaged black fishers into the fishing sector to provide them with an avenue out of poverty. However, simultaneous environmental policies restrict such fishers' access to marine resources. As a result, impoverished black fishers throughout the country still lack access to a sufficient amount of marine resources to obtain sustainable livelihoods, and poverty is not decreasing in many coastal communities. The study asks the research question: How effective have South Africa's fishing policies been in alleviating poverty and protecting the marine resources in impoverished coastal communities, and what has been the rationale for implementing such policies?

The case study was conducted in a fishing village in the Eastern Cape province of South Africa. A total of 20 individual interviews were conducted over a three-week period. By conducting research with both community members and policy informants, this study has analysed the disconnect between the government's rhetoric of making impoverished fishers beneficiaries of the fishing industry and the realities on the ground. It was discovered that community fishers have restricted access to marine resources because the sustainability of the fish stock is under threat. However, the primary contributors to the depletion are outside fishing vessels and an increasing number of poachers on foreign fishing fleets. Due to a lack of monitoring and resources, the government faces great challenges in seeking to control the illicit trade, and the easiest trade to monitor is that of small-scale fishers, who often depend on the resources for their livelihoods.

Limited resources to monitor fishing vessels have been used as rationale for the government to instead control and minimize the trade for coastal inhabitants. The government's strategy of integrating historically disadvantaged blacks into the fishing industry through alleviating poverty and protecting the marine resources remains a significant challenge in South Africa. Instead of targeting marginalized fishers with environmental policies, rather large-scale fishers should be the focus in order to strive for marine resource sustainability. This study should be extrapolated to other cases where such complex relationships between poverty alleviation and environmental sustainability exist.

Use of indigenous knowledge in mitigating and adaptation of the Impacts of Climate change in Zanzibar

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Abstract

As environmental change has already affected local people's livelihoods in the past, in many cases indigenous peoples particularly in Small Island Developing States (SIDS) have developed specific coping strategies to extreme variations of weather. In the light of climate change adaptation efforts currently being undertaken in Zanzibar and other parts of Tanzania, there is a need to provide detailed information on experience on climate change impacts and coping strategies adopted by different communities to protect against the climate change crisis.

The objective of the study is to explore and document the impacts of climate change and indigenous knowledge strategies used by local communities in Zanzibar, particularly around two selected Marine Protected Areas (Jozani forest/Chwaka bay complex and Ngezi forest including coastal zone). Methods for data collection were based on both desk, making the use of the relevant literatures identified to address the objectives of the study, and the field surveys where primary data were collected. Structured and semi-structured questionnaires together with checklist guides for the focus group discussion were used. SPSS and excel were used to analyze and interpret results into meaningful inferences. The survey reveals that both terrestrial and marine ecosystems in Zanzibar islands and surrounding local communities are already victims of climate change impacts and they are in great threats of being more vulnerable to other associated environmental problems. The results of this study reveal that the local coping strategies within the local communities have been taking place through individual basis rather than group. Interestingly, the factor of age group seems to have a significant impact on climatic change coping strategies. Zanzibar as one among SIDS is aware of the impacts of climate change and the need to adapt, but the islands, on the other hands, are not well organized in mainstreaming local adaptation strategies into their policy frameworks and development efforts. There are a lot of efforts that have been initiated by different departments and institutions but there is no coordinating "vehicle" that can take appropriate efforts to overcome existing barriers towards "genuine" adaptation of climate change. Therefore, purposive and focused effort is needed to harmonize the climate change problems by coordinating and involving other research and academic institutions like The State University of Zanzibar, Institute of Marine Science and relevant government departments and NGOs.

MEMO